



***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

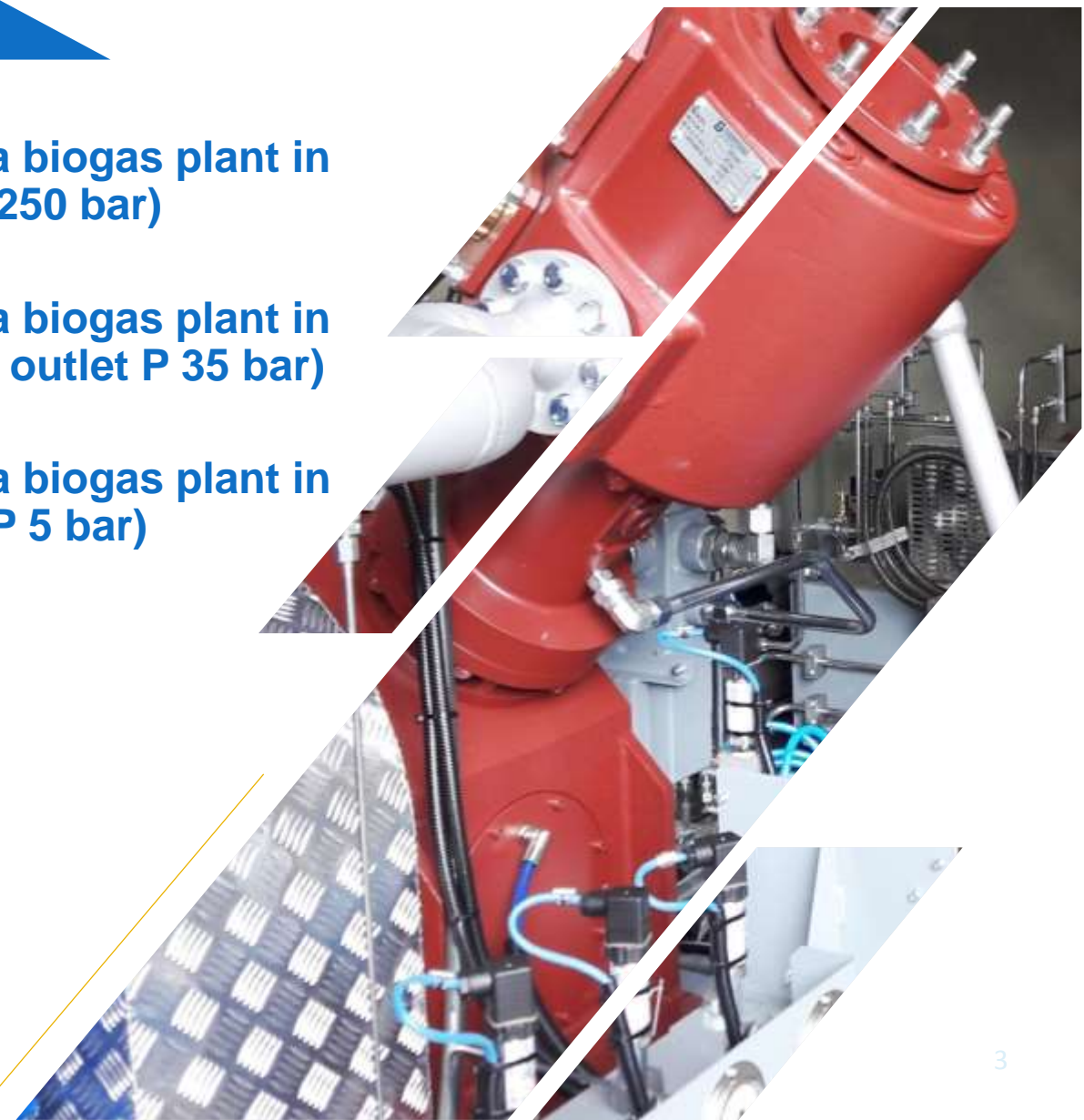
**2005 – FORNOVO GAS supplied the first compressor in a biogas plant in Iceland to compress biomethane (inlet P 15 bar, outlet P 250 bar)**

**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

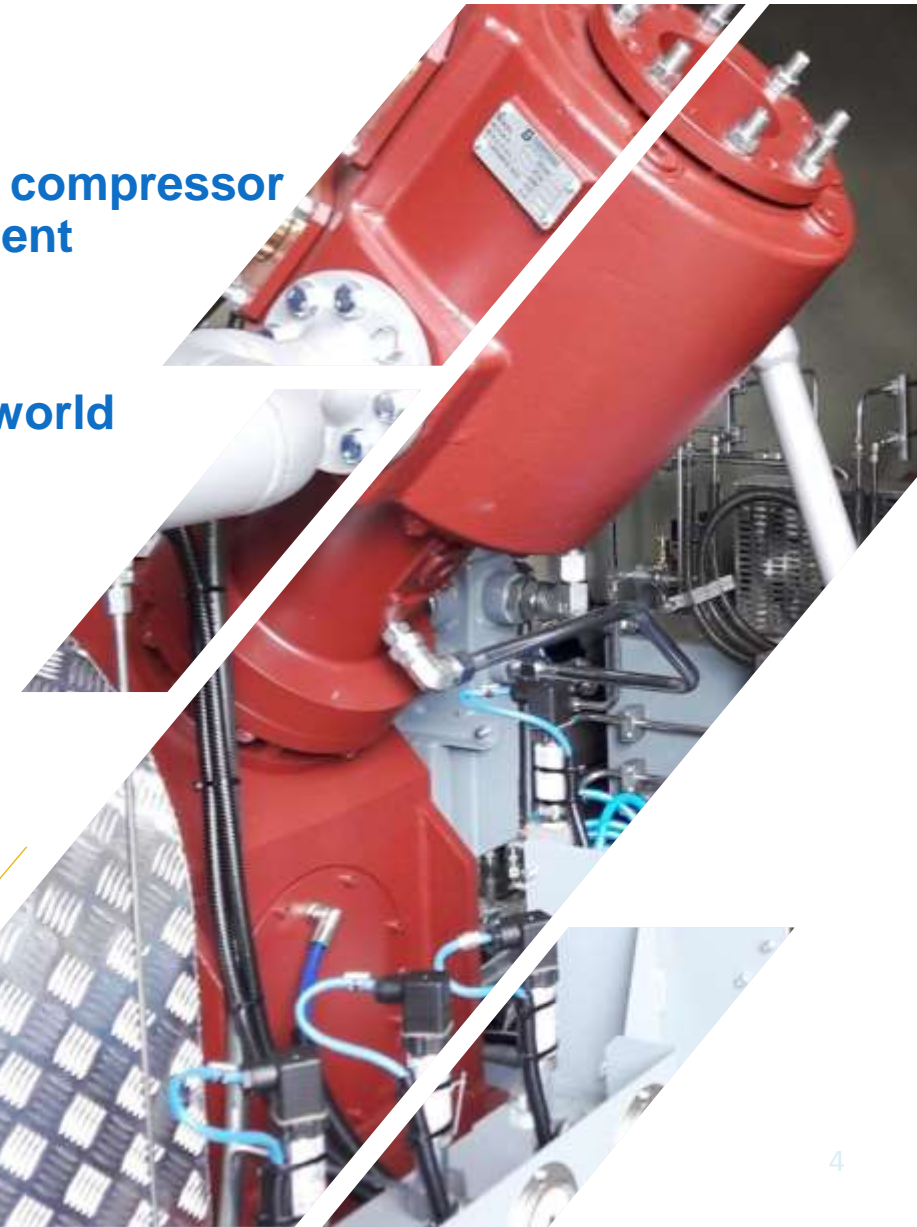




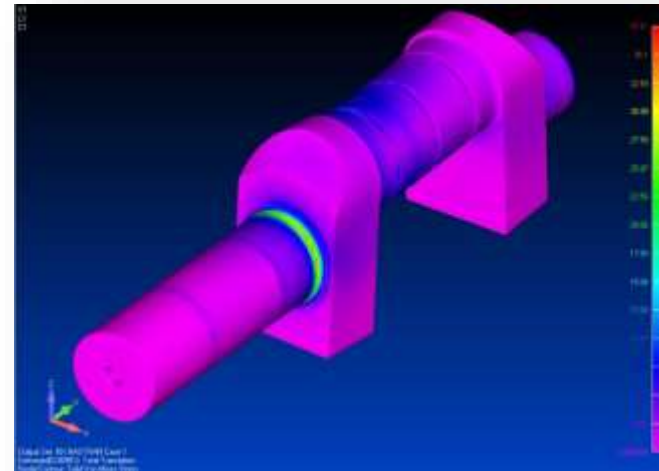
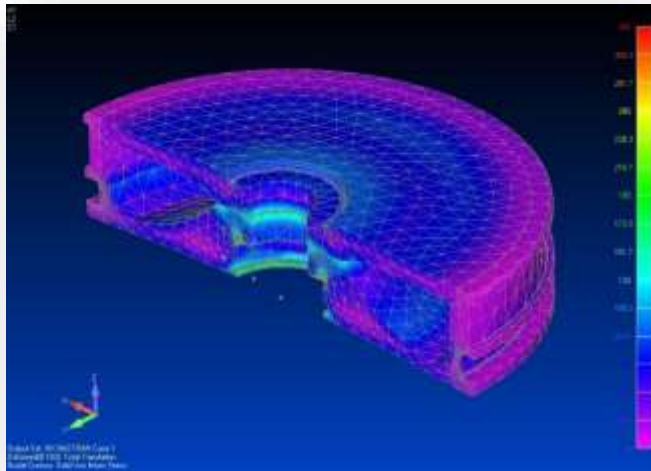
# COMPRESSOR FEATURES

**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**

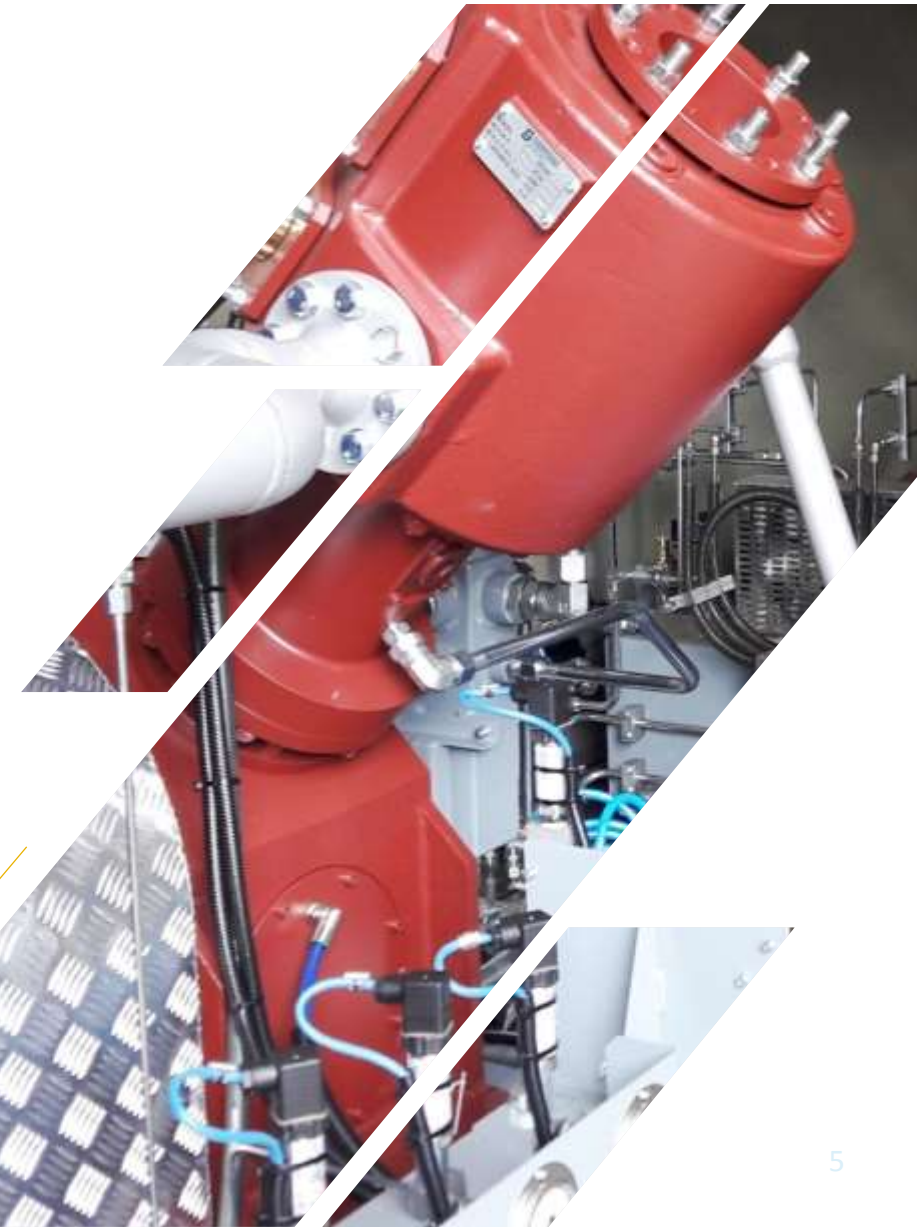
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**Strength increase**  
**Strain containment**  
**Weight saving**

**Crankshaft optimization**

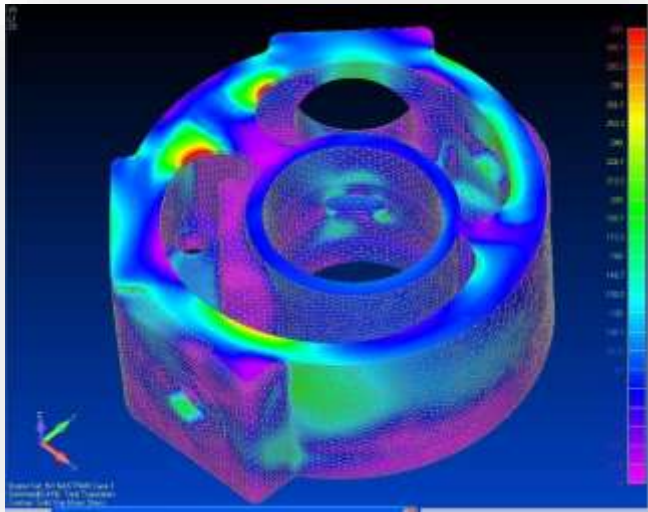
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**Strength increase**  
**Strain containment**  
**Weight saving**





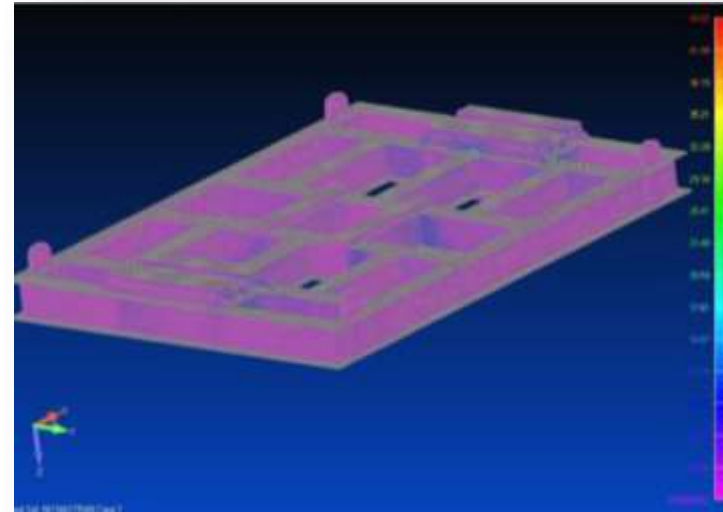
# COMPRESSOR FEATURES



**Cylinder optimization**

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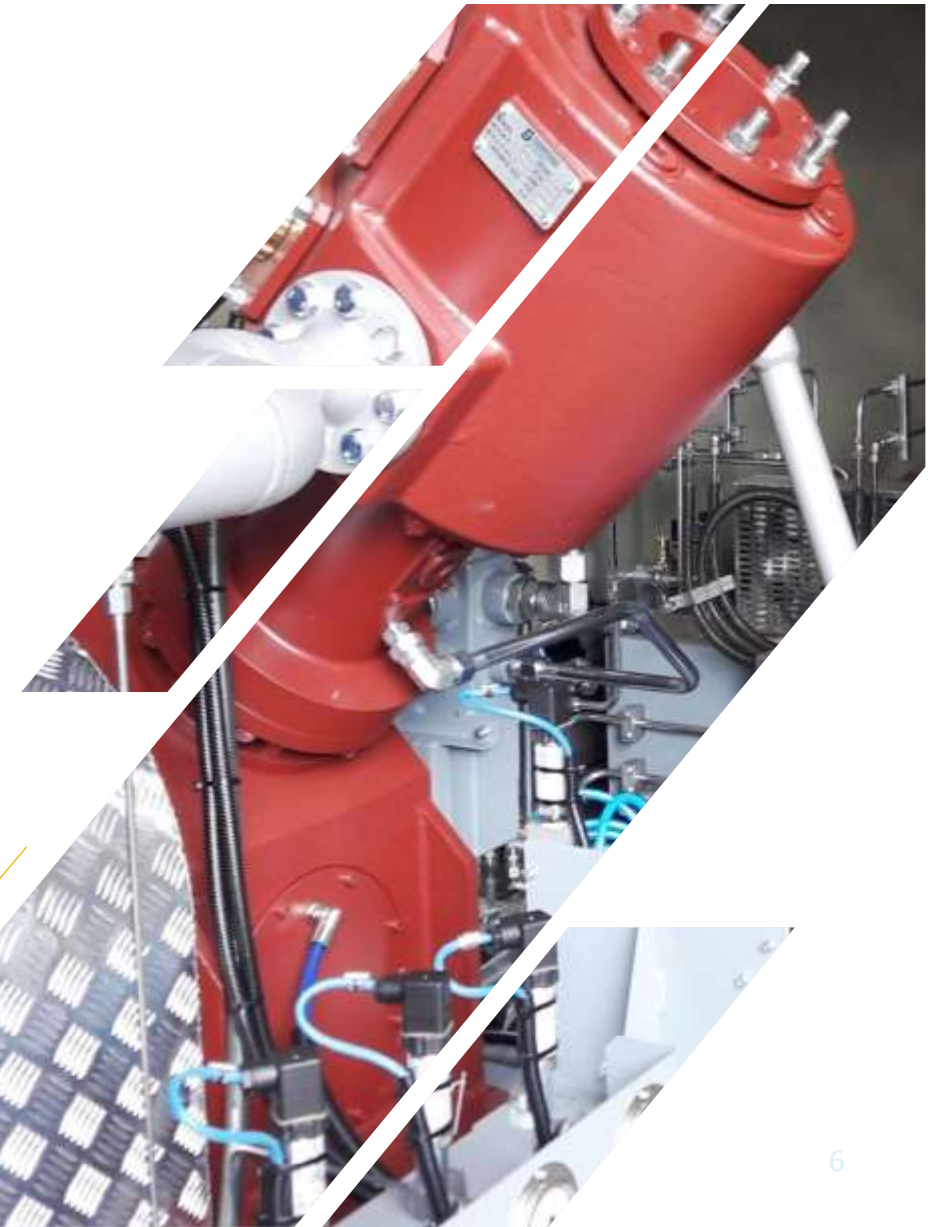
**Strength increase**  
**Reduction of vibration**  
**Increased range of inlet  
pressure up to 90 bar**



**Baseplate optimization**

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**Strength increase**  
**Perfect balance**  
**Weight saving**



# COMPRESSOR FEATURES

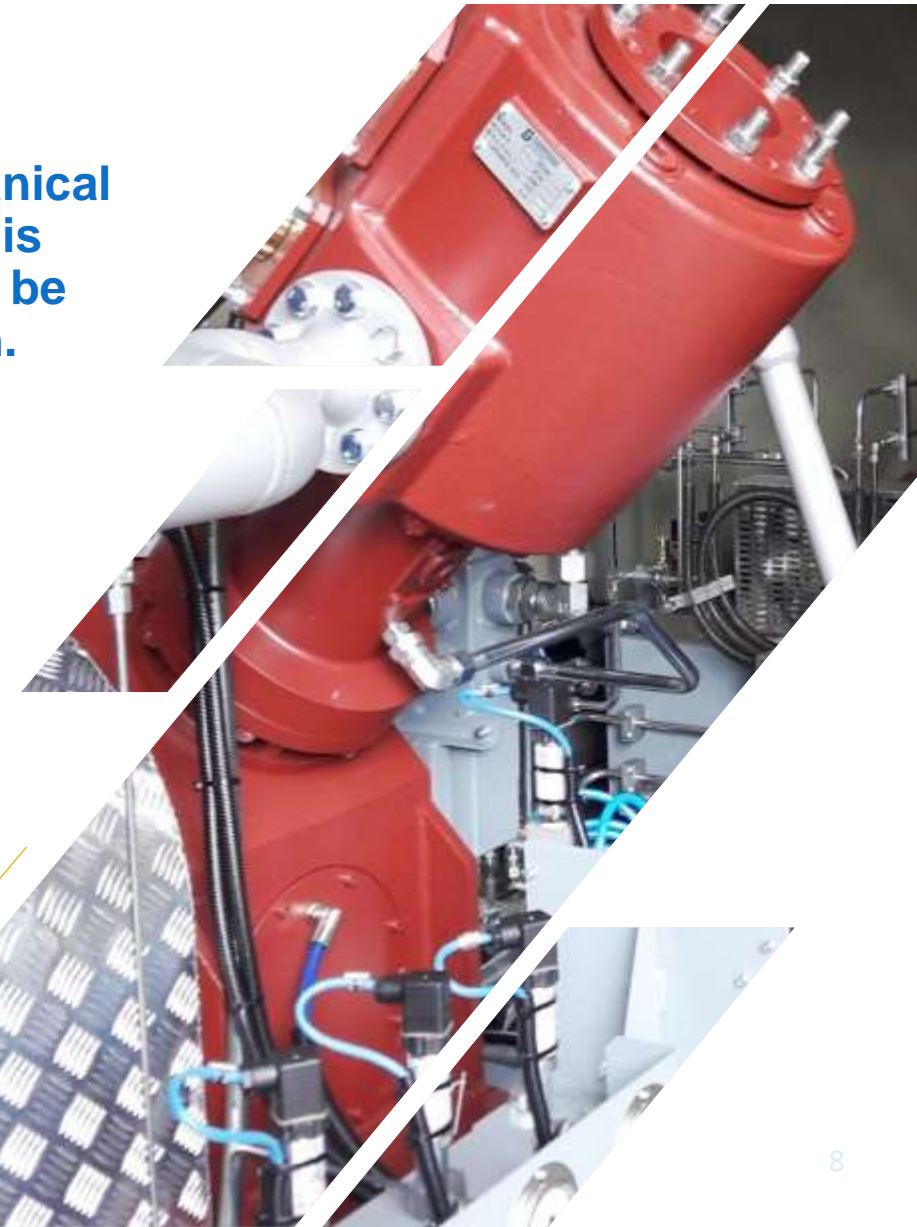
- Non lubricated cylinders
- Two or three cylinders, V or W shape configuration
- Cylinders for very low suction pressures as well as for 375 bar (g) MAWP are available
- Extremely low vibration amplitudes, velocities and accelerations
- Sturdy yet compact design
- Direct coupling (electrical or gas 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.

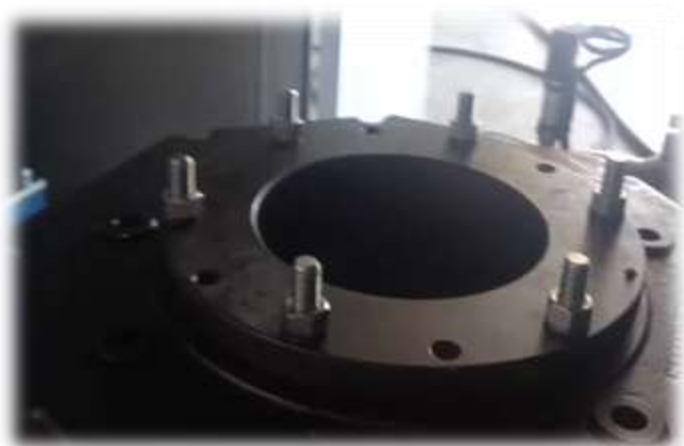




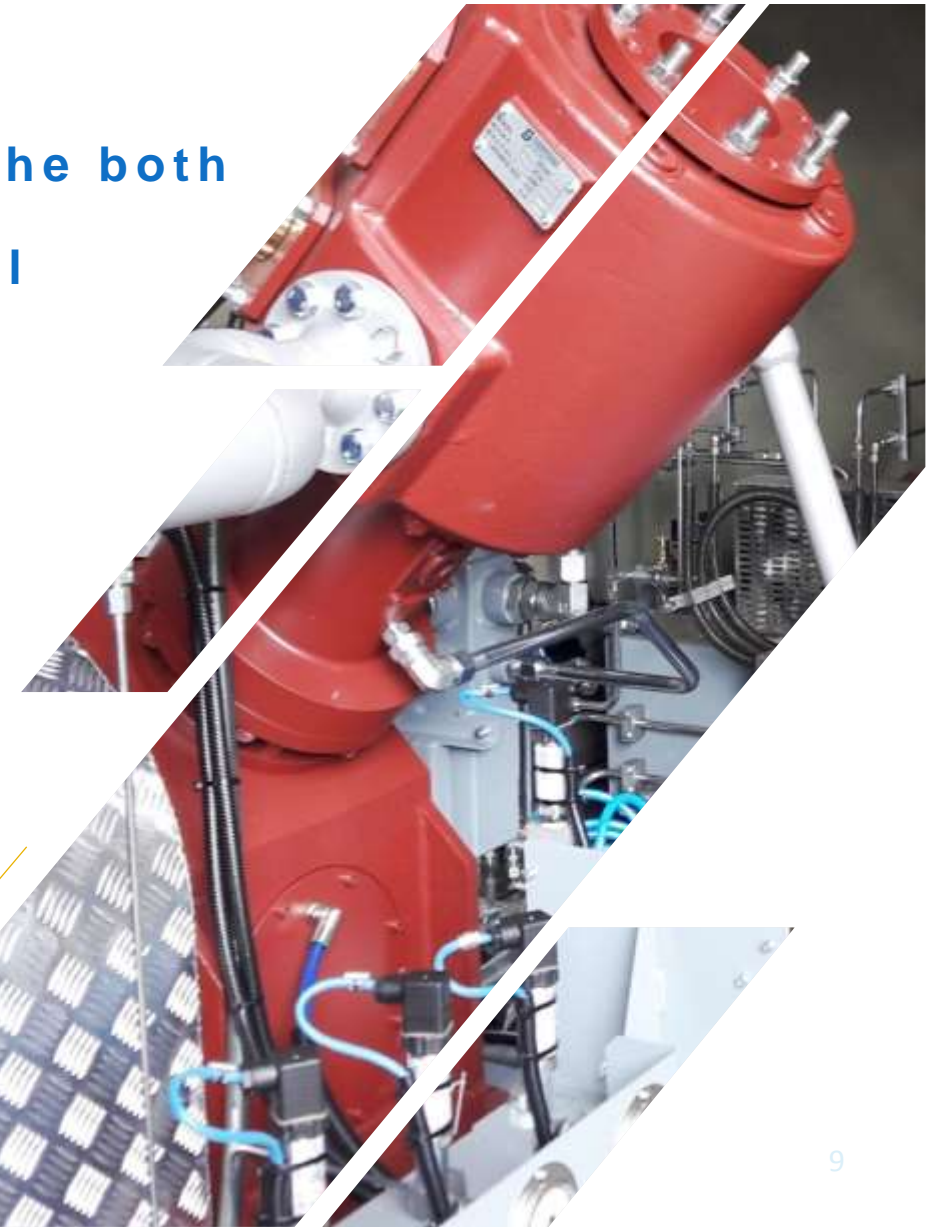
# COMPRESSOR FEATURES

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.

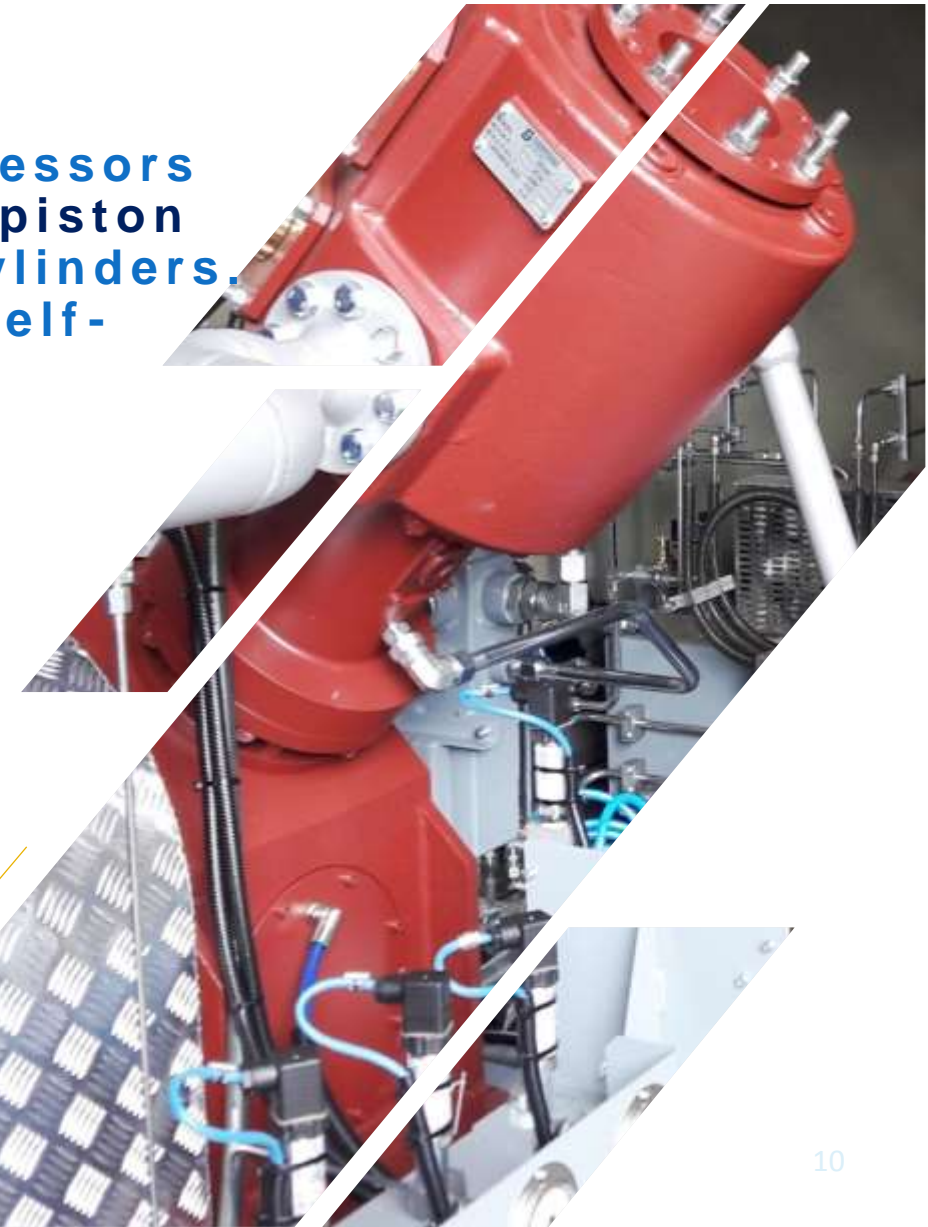
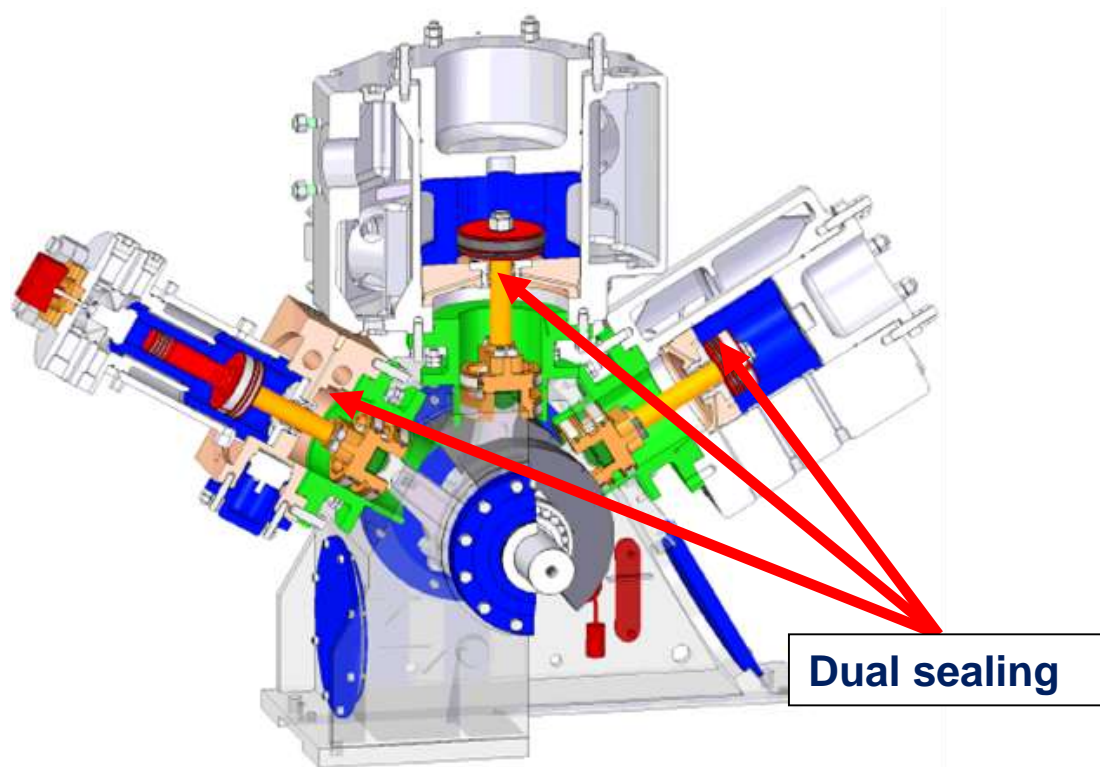


Coin test



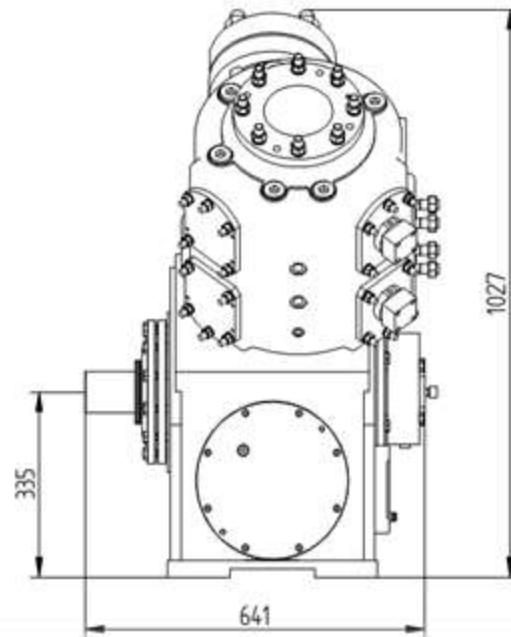
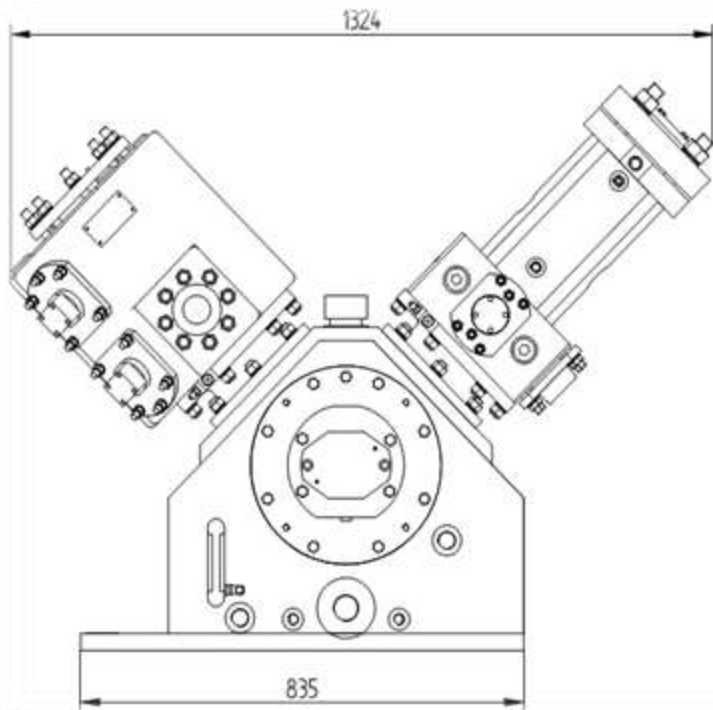
# COMPRESSOR FEATURES

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.



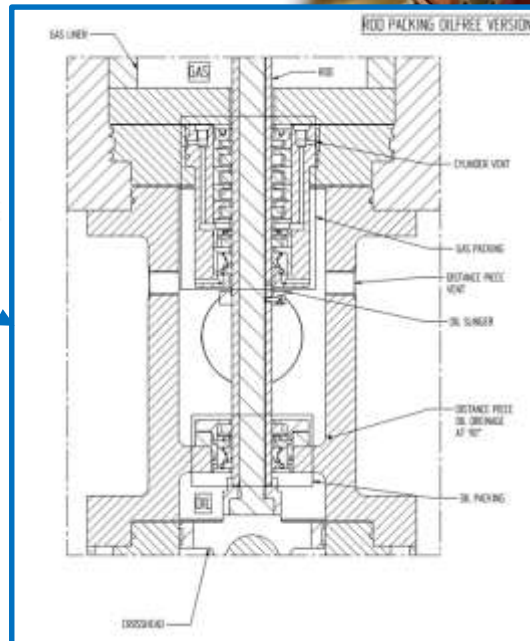
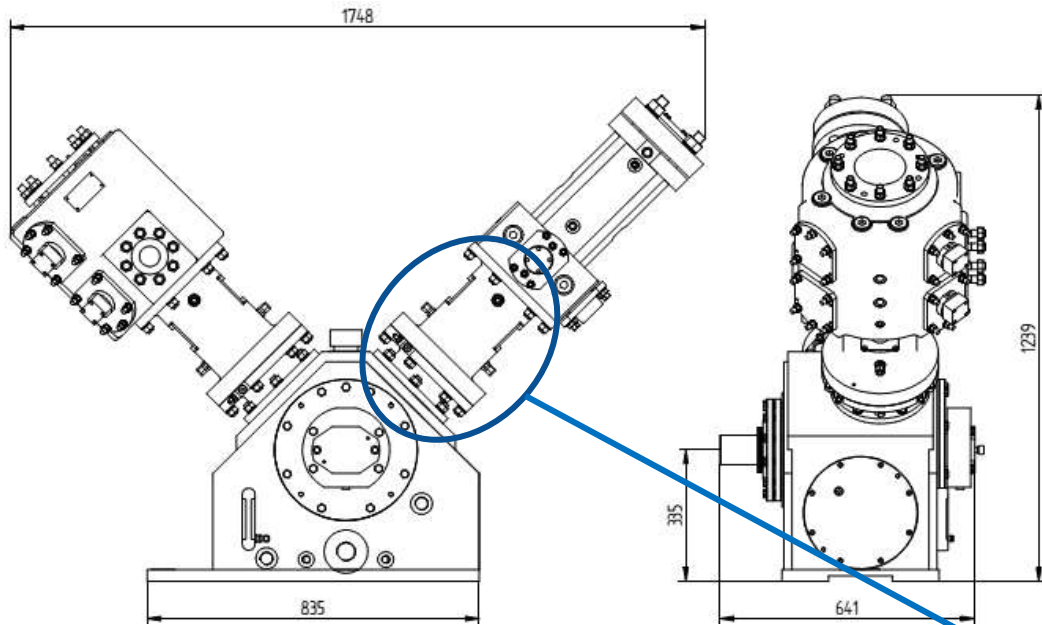


# NOT LUBRICATED CONFIGURATION





# OIL FREE CONFIGURATION



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

# QUALITY CONTROL

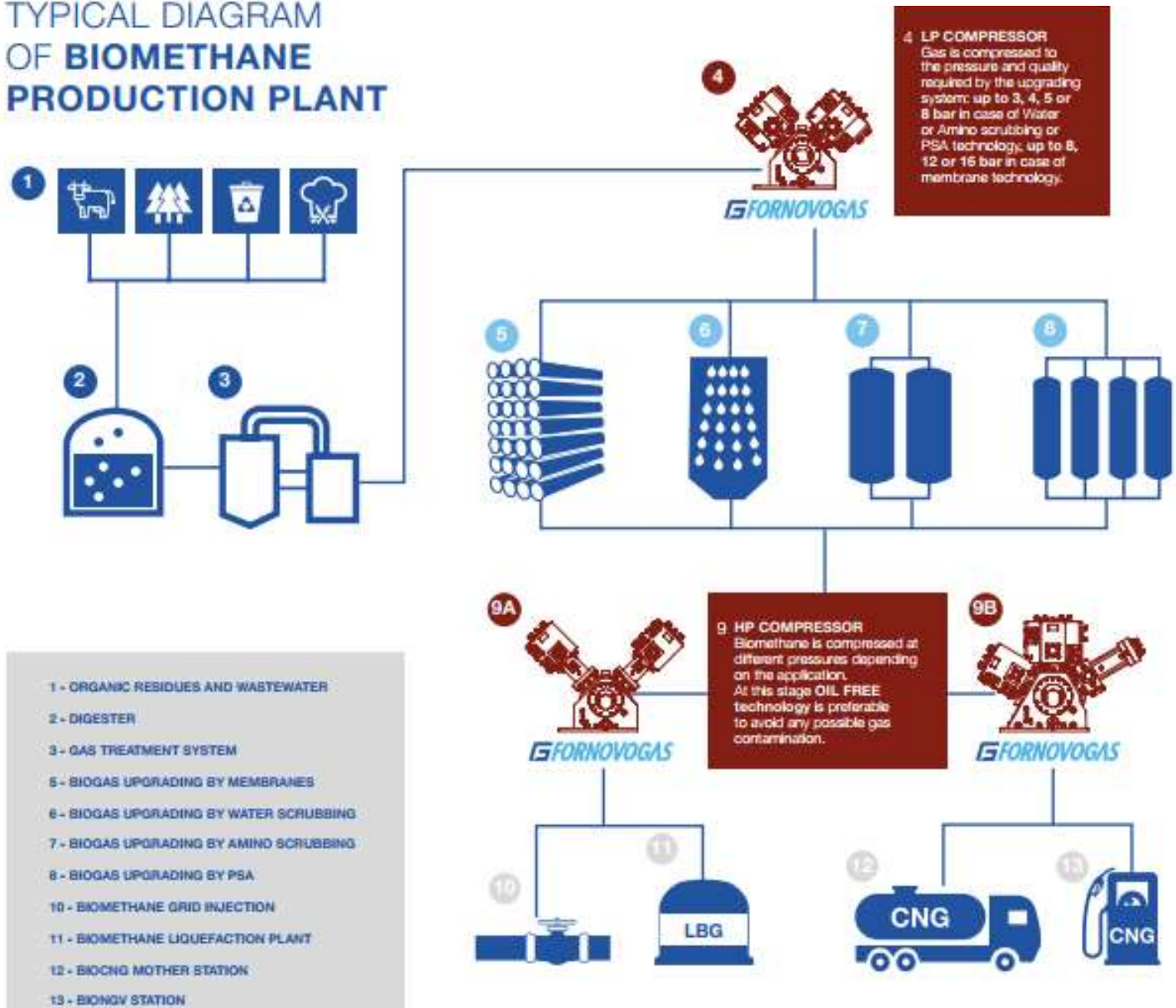
- Quality Management system certified ISO9001:2015
- Environmental Management certified ISO14001:2015
- Health and Safety Management certified OHSAS18001:2007
- 3D quality control on each critical component through Carl Zeiss technology
- Hydraulic test performed on all pressure equipment
- Regular audit 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



1 - ORGANIC RESIDUES AND WASTEWATER

2 - DIGESTER

3 - GAS TREATMENT SYSTEM

5 - BIOGAS UPGRADING BY MEMBRANES

6 - BIOGAS UPGRADING BY WATER SCRUBBING

7 - BIOGAS UPGRADING BY AMINO SCRUBBING

8 - BIOGAS UPGRADING BY PSA

10 - BIOMETHANE GRID INJECTION

11 - BIOMETHANE LIQUEFACTION PLANT

12 - BIO-CNG MOTHER STATION

13 - BIO-CNG STATION



# 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 Sm<sup>3</sup>/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 Sm<sup>3</sup>/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 Sm<sup>3</sup>/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 1<sup>st</sup> 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***

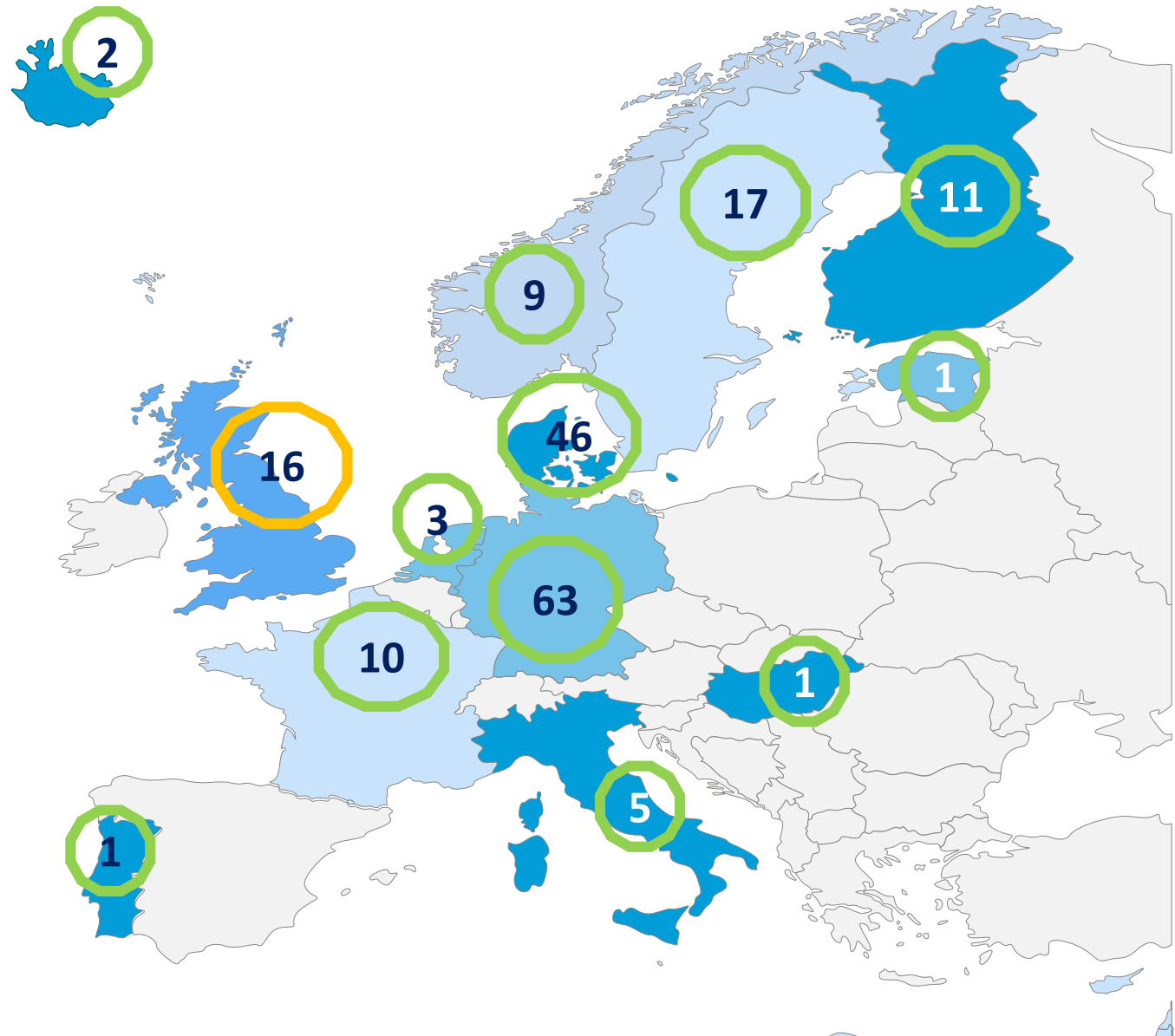




# EXPERIENCE

**185 compressors already operational in Biomethane production plant in Europe**

**43 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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/h**
- **Power 110kW**



# SONDERIYSK (Denmark)

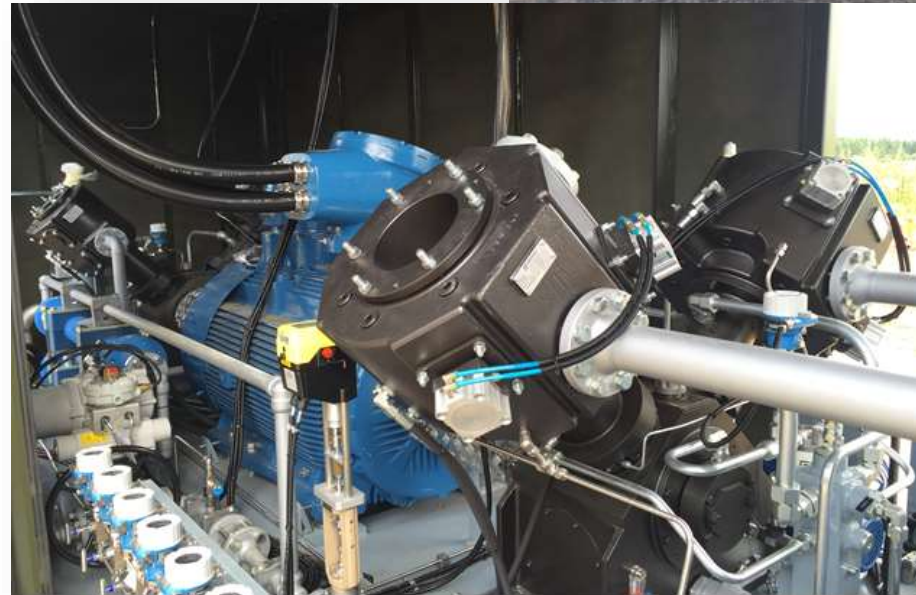
**Model: 3DA300 OIL FREE in Gasvector cabinet**

**Service: Gas injection**

**Gas: Dry biomethane**

**Features:**

- **Inlet pressure 3-4 bar**
- **Outlet pressure 47-80 bar**
- **Flowrate 1000-2800 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/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 Nm<sup>3</sup>/h**
- **Power 160kW**



# MORTAGNE SUR SÈVRE (France)

**Model: 4DA300 in GASVECTOR cabinet**

**Service: NGV station**

**Gas: Dry biomethane**

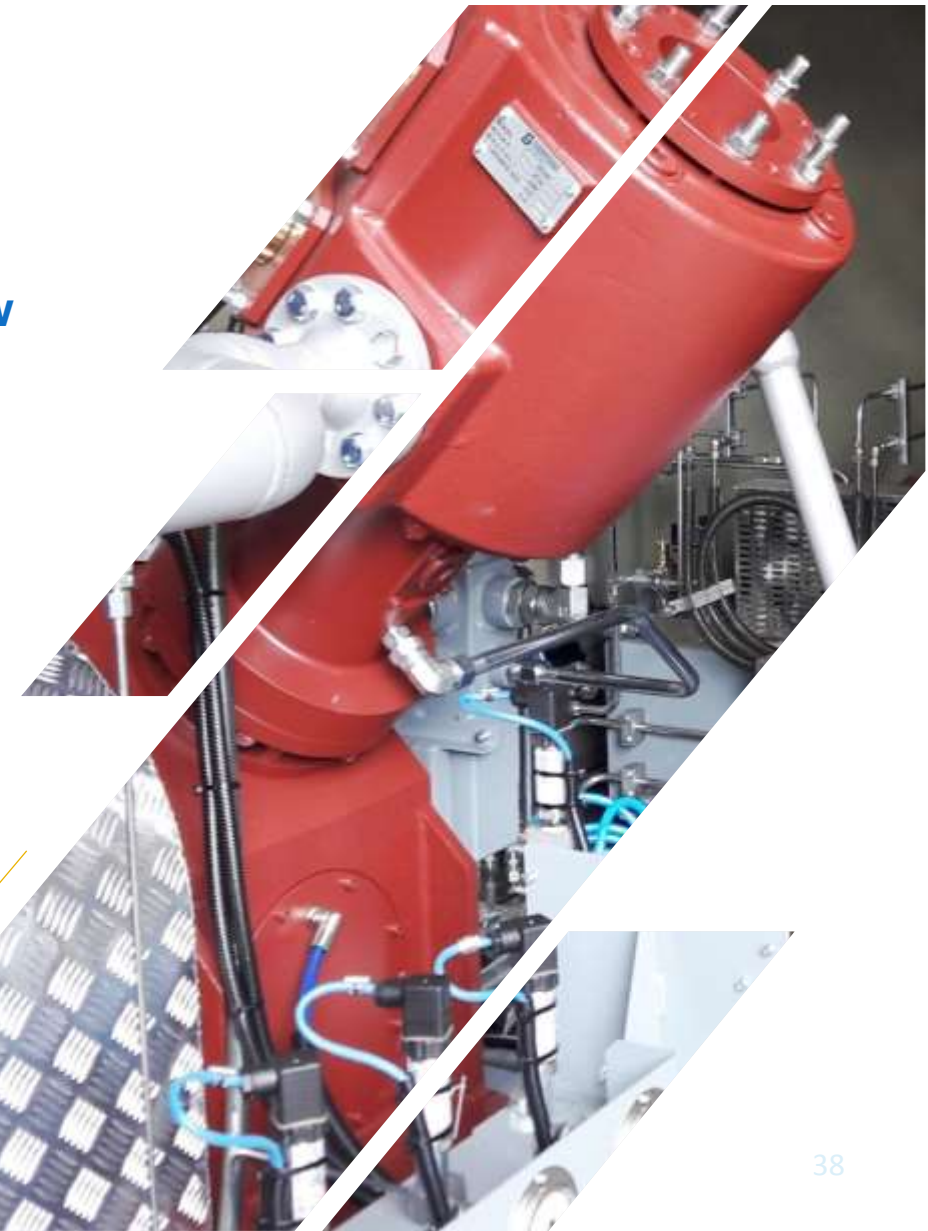
**Features:**

- Inlet pressure 4 bar
- Outlet pressure 250 bar
- Flowrate 500 Nm<sup>3</sup>/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 Sm<sup>3</sup>/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](http://www.fornovogas.it)

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