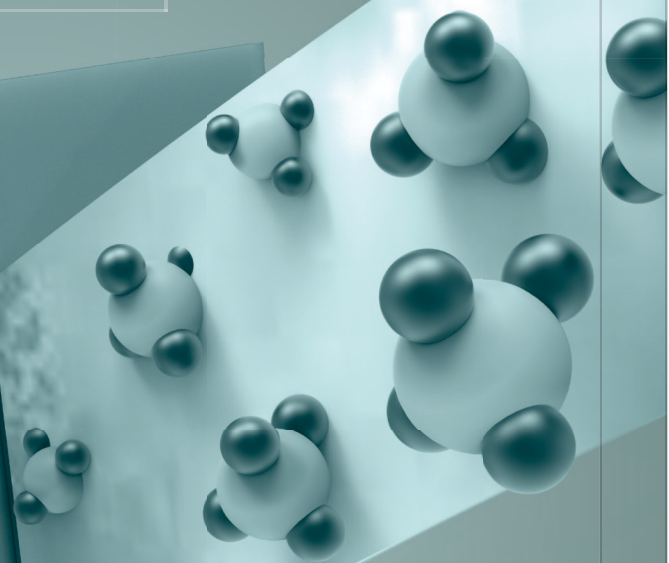


*Plants for the production  
of biomethane and CO<sub>2</sub> from biogas*

A 3D molecular model of a gas molecule, likely representing a hydrocarbon or a simple organic compound, is shown in a light blue, semi-transparent environment. The molecule consists of several dark grey spheres (representing carbon atoms) and smaller white spheres (representing hydrogen atoms) arranged in a specific geometric structure. The background features abstract, overlapping planes in shades of blue and grey, creating a sense of depth and a technical, scientific atmosphere.

Biogas Upgrading:  
Optimal Biomethane production

# From Biogas to Biomethane an eco-friendly and effective purification process

Tecno Project Industriale (TPI) offers a comprehensive range of systems to cover each stage of the biogas treatment process: Biogas Upgrading plants with membrane or selective solvent, biogas and biomethane compressors, biomethane dryers, analysis systems for CO<sub>2</sub> and CO<sub>2</sub> recovery systems.

TPI's Biogas Upgrading plants purify and refine biogas produced from OFMSW (Organic Fraction Municipal Solid Waste), processing scrap and by-products, effluent from livestock farming, crop wastes and other biomass. The biogas obtained from these materials contains primarily methane (actually biomethane) and carbon dioxide, in variable percentages depending on the initial product, but typically around 50% - 60% for biomethane and

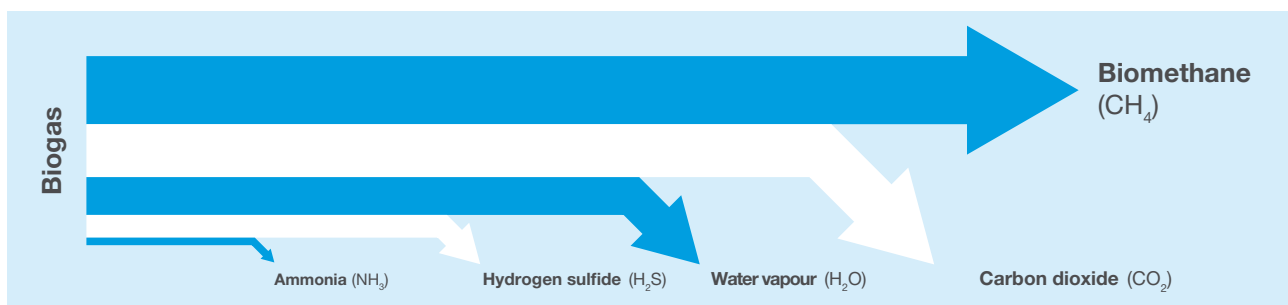
around 40% for CO<sub>2</sub>. The international renown of TPI, with its more than three decades of experience in plant production, is built on the company's consolidated ability to treat gas mixtures and recover CO<sub>2</sub> of exceptionally high quality with optimal operating costs. TPI offers expertise and know-how which, backed by solid experience in the sectors of gas compression, purification, deoxidation, production and recovery, is equivalent to a guarantee of absolute reliability.

## Technology and know-how

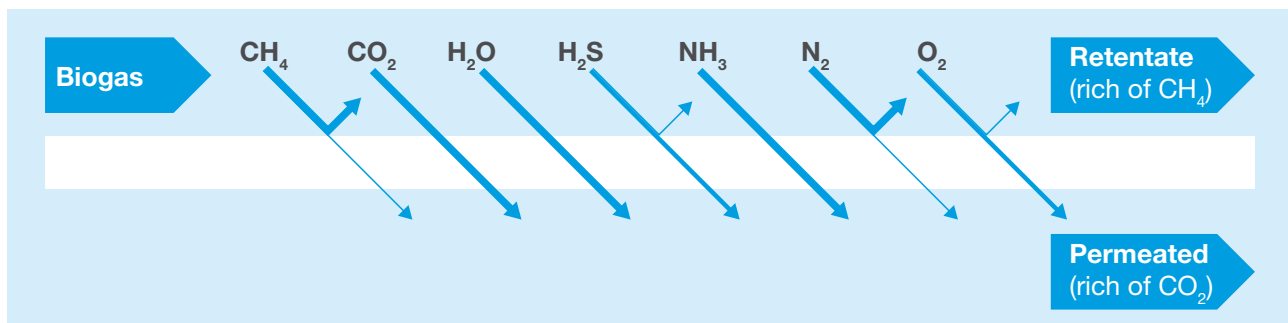
The advanced technology built into the Biogas Upgrading plants allows the separation of a large number of different components that are appropriately filtered and removed allowing the biomethane obtained to gain advanced biofuel certification in compliance with the network code and also further specific market requirements.

## The benefits of Biomethane production

- Economic exploitation of agricultural biomass, processing scrap and OFMSW (Organic Fraction of Municipal Solid Waste);
- reduction of environmental impact to promote the creation of a circular economy;
- opportunity to boost business income thanks to the use of biomethane for injection into the network, for the permitted uses, or for sale as an automotive fuel (LNG or CNG system).



Biogas composition



Different gas permeability through a specific treatment

# Biogas Upgrading with 3-stage HPSM Membrane Systems

Several technologies exist for biogas treatment and refinement. Tecno Project Industriale proposes exclusively the solutions it deems to be the most valid. One such solution involves the use of ultra-high selectivity polymeric refinement membranes (HPSM) that allow the achievement of high refined gas flow rates and high yields without using chemical agents.

## Efficiency and versatility

The HPSM plants developed and industrialised by TPI make it possible to obtain high levels of purity with recovery efficiency in excess of 99%, thus making the pure biomethane suitable for distribution in national gas networks.

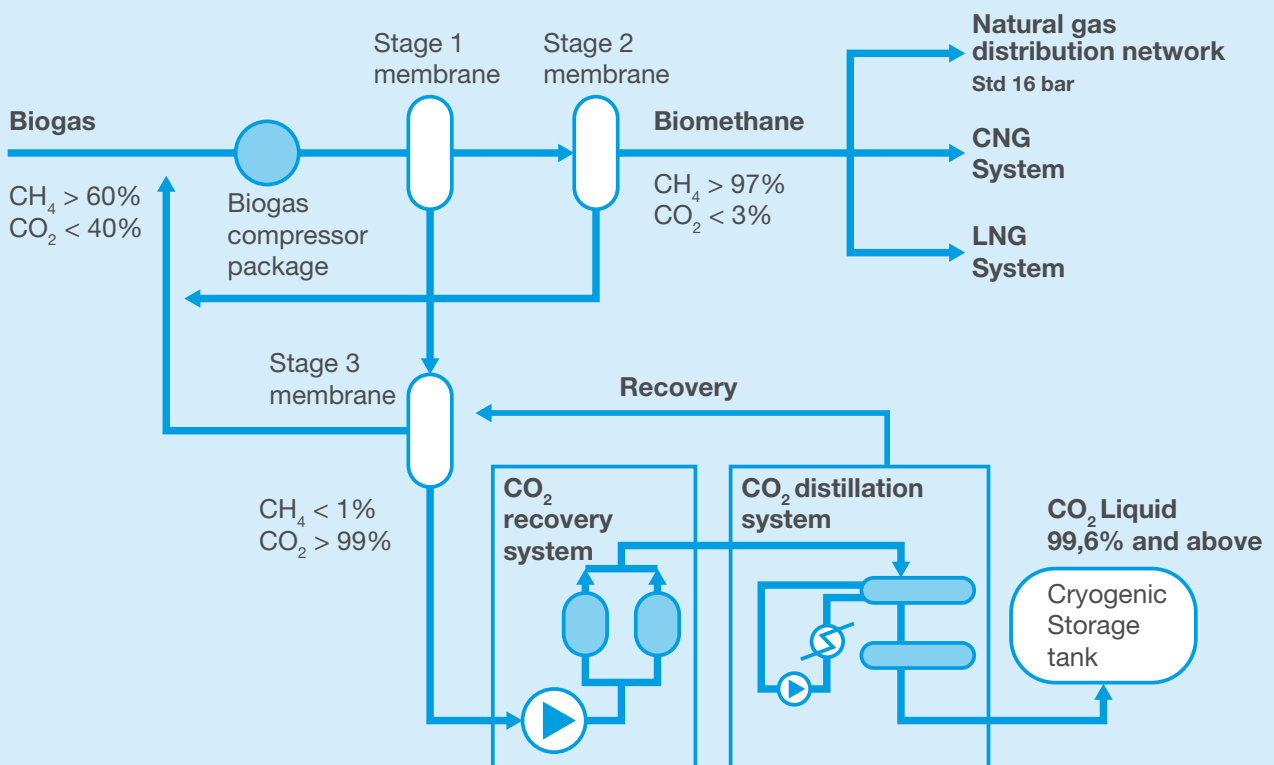
## Characteristics

- High pressure operating system;
- the CO<sub>2</sub> can be easily recovered with a suitable TPI plant, also making it possible to eliminate the small loss of methane completely;



- simple and innovative system;
- biomethane delivery pressure from 10 to 20 bar; biogas flow rate from 50 Nm<sup>3</sup>/h to 3,000 Nm<sup>3</sup>/h.

## HPSM biogas treatment process



# Biogas Upgrading with Selective Solvent Plants

A traditional method, consolidated through time and well known, for separation of acid gases (namely CO<sub>2</sub>) from various stream types (flue gas, biogas, syngas, etc.) has been applied also to biogas by TPI for many years, with customers in several different countries.

The selective solvents system operates at low pressure and requires heat in the form of steam for solvent regeneration. Separation achieved by means of this process is extremely efficient. This solution is also ideal for use in situations where network injection occurs at low pressure.

## High performance

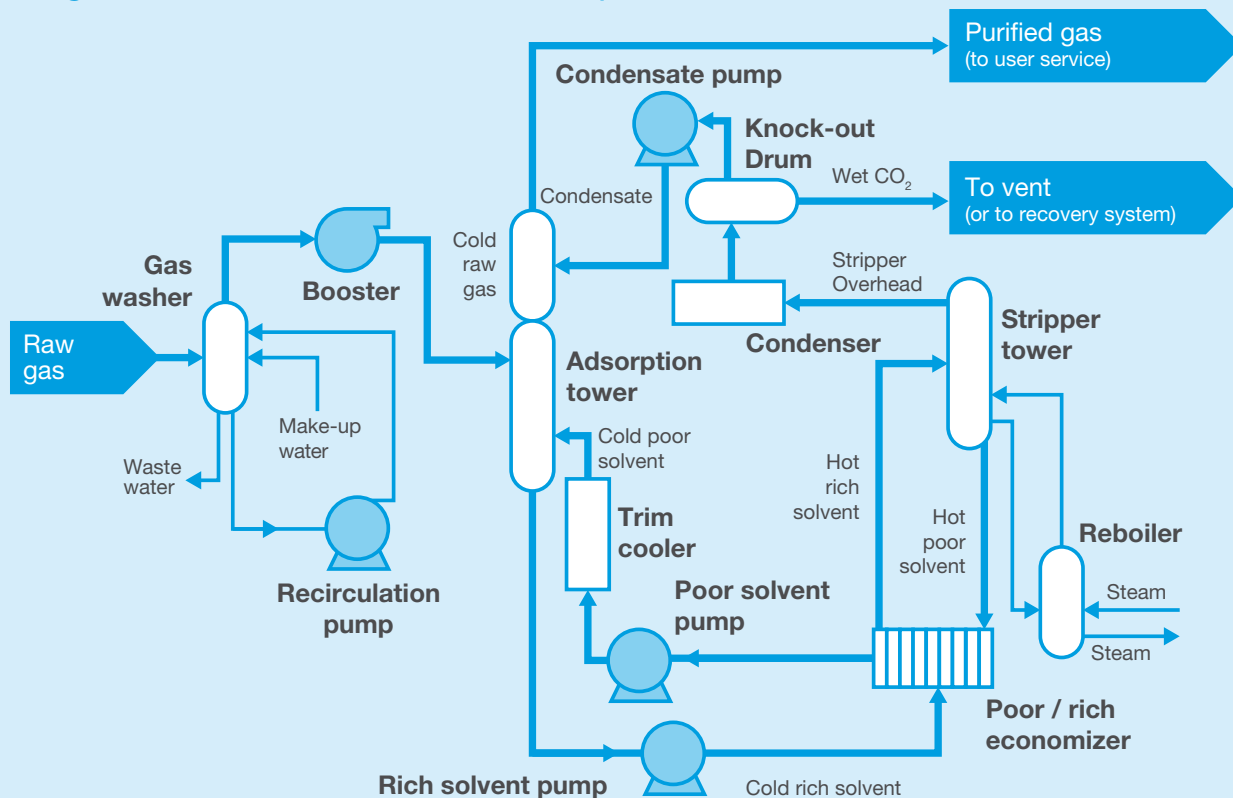
The plant technology is based on the use of a dedicated solvent enriched with specific additives suitable for the treatment of biogas, that also allow the removal of CO<sub>2</sub> without any special pre-treatment process. The biomethane obtained by this process is of extremely high purity (more than 99%). With respect to traditional amines, solvent consumption is far lower.



## Characteristics

- Flow rate from 500 Nm<sup>3</sup>/h;
- high purity of CH<sub>4</sub>;
- high purity of CO<sub>2</sub>;
- ideal also for possible successive production of bio-LNG.

## Biogas selective solvents treatment process



## Biogas Upgrading: Utilities

### Compressors for Biogas and Biomethane

TPI's consolidated experience also includes expertise in the production of biogas and biomethane compression skids with flow rates from 100 kg/h to 4,000 kg/h. The biogas compression unit processes the raw gas using lubricated screw compressors and dry piston

compressors; conversely, the biomethane compression unit functions with natural gas without H<sub>2</sub>S and CO<sub>2</sub> contents and is based on a single-stage or two-stage reciprocating compressor. Both solutions are completely pre-assembled and factory tested.



### Biomethane Dryers

The innovative range of biomethane dryers produced by TPI is composed of activated alumina/molecular sieve type dryers constructed of stainless steel throughout and capable of drying the refined gas fully to reach exceptionally low levels of residual moisture contents.



### CO<sub>2</sub> Recovery Plants

All TPI's Biogas Upgrading plants can be equipped with a dedicated section for recovery of carbon dioxide, a valuable by-product of the biogas upgrading process, with recovery efficiency of 99%.

These units are composed of a compression stage, a drying and purification stage, a liquefaction stage and a cryogenic tank for storage of liquid CO<sub>2</sub>. When the CO<sub>2</sub> plant is installed it is also possible to completely recover the residual methane (the "slip" in the CO<sub>2</sub>).





# The SIAD Group

Engineering

Technical gases



LPG and Natural Gas

## Technical gases

### SIAD S.p.A.

Via San Bernardino, 92  
I-24126 BERGAMO  
Tel. +39 035 328111 - Fax +39 035 315486  
www.siad.com - siad@siad.eu  
GPS: N 45 40.57 - E 9 39.44

### ARROWELD ITALIA S.p.A.

Via Monte Pasubio, 137  
I-36010 ZANÈ (VI)  
Tel. +39 0445 804444 - Fax +39 0445 804400  
www.arroweld.com - arroweld@arroweld.com  
GPS: N 45 43.18 - E 11 26.21

### Bieffe Saldatura S.r.l.

Via Canubia, 9/1  
I-12020 MADONNA DELL'OLMO (CN)  
Tel. +39 0171 414711 - Fax +39 0171 414700  
www.bieffesaldatura.com - info@bieffesaldatura.com  
GPS: N 44 25.30 - E 7 33.36

### Tecnoservizi Ambientali S.r.l.

Via San Bernardino, 92  
I-24126 BERGAMO  
Tel. +39 035 328111 - Fax +39 035 328393  
www.tecnoserviziambientali.eu - info@tasrl.com  
GPS: N 45 40.57 - E 9 39.44

### AUSTRIA

SIAD Austria GmbH  
Bergwerkstrasse 5  
A-5120 ST. PANTALEON  
Tel. +43 (6277) 7447-0 - Fax +43 (6277) 7401  
www.siad.at - siad@siad.at  
GPS: N 48 01.34 - E 12 51.36

### BULGARIA

SIAD Bulgaria EOOD  
4, Amsterdam str. P. O. Box 28  
BG-1528 SOFIA  
Tel. +359 (2) 9785636 - Fax +359 (2) 9789787  
www.siad.bg - siad@siad.bg  
GPS: N 42 39.15 - E 23 24.43

### CZECH REPUBLIC

SIAD Czech spol. s r.o.  
Prague Office Park II - K Hájům 2606/2b  
CZ-155 00 PRAGUE 5  
Tel. +420 235097520 - Fax +420 235097525  
www.siad.cz - siad@siad.cz  
GPS: N 50 03.21 - E 14 19.32

### HUNGARY

SIAD Hungary Kft.  
Zsigmondy u. 38.  
H-3527 MISKOLC  
Tel. +36 (46) 501130 - Fax +36 (46) 501131  
www.siad.hu - siad@siad.hu  
GPS: N 48 07.25 - E 20 48.07

### POLAND

SIAD Poland sp. z o.o.  
ul. Kokotek 66  
PL-41-700 RUDA ŚLĄSKA  
Tel. +48 32 7711650 - Fax +48 32 7711667  
www.siad.pl - siad@siad.pl  
GPS: N 50 18.25 - E 18 51.55

### ROMANIA

SIAD Romania s.r.l.  
Drumul Osiei, 75-79, Sector 6  
RO-062395 BUCUREȘTI  
Tel. +40 (21) 3103658 - Fax +40 (21) 3149806  
www.siad.ro - siad@siad.ro  
GPS: N 44 26.26 - E 25 59.10

### RUSSIA

LLC SIAD Rus  
Bolshaya Dmitrovka street 12/1 - build 1, 3 floor  
RU-107031 MOSCOW  
Tel./Fax +7 (495) 7213026  
www.siad.ru - siad@siad.ru  
GPS: N 55 45.41 - E 37 36.53

### SLOVAKIA

SIAD Slovakia spol. s r.o.  
Rožňavská č. 17, SK-831 04 BRATISLAVA  
Tel. +421 (2) 44460347 - Fax +421 (2) 44460348  
www.siad.sk - siad@siad.sk  
GPS: N 48 10.29 - E 17 09.47

### UKRAINE

LLC SIAD Ukraine  
Konstantinovskaya street, 2A  
UA-04071 KIEV  
Tel. +7 495 9871217

### LLC Remtekhgaz

Kolomojtsjevskaya street, 28  
UA-50106 KRIVROY ROG  
Tel. +38 093 3978017  
www.rtg.com.ua

## Engineering

### SIAD Macchine Impianti S.p.A.

Via Canovine, 2/4  
I-24126 BERGAMO  
Tel. +39 035 327611 - Fax +39 035 316131  
www.siadmi.com - siadmi@siad.eu  
GPS: N 45 40.53 - E 9 39.44

### Roboteco S.p.A.

Via Carlinga, 43  
I-24035 CURNO (BG)  
Tel. +39 035 5780303  
www.roboteco.it - roboteco@roboteco-italargon.it  
GPS: N 45 40.35 - E 9 36.25

### SIAD Macchine Impianti Trading (Shanghai) Co. Ltd.

Rm.412, No. 5 building, No. 999 Ningqiao Rd  
Pudong Jingqiao EPZ  
CN-201206 SHANGHAI  
Tel. +86 (0)21 50550066 - Fax +86 (0)21 50318959  
www.siadmi.cn/sh - siadmi\_sh@siad.eu  
GPS: N 31 15.19 - E 121 37.4

### SIAD Engineering (Hangzhou) Co. Ltd.

21F, Weixing Bld., No. 252 Wensan Road Xihu District  
Zhejiang, P.R. China  
CN-310012 HANGZHOU  
Tel. +86 (0)571 85880480 - Fax +86 (0)571 85880490  
www.siadmi.cn/hz - siad\_hz@siad.eu  
GPS: N 30 16.46 - E 120 07.51

### SIAD Macchine Impianti Middle East F.Z.C.

M1-03, P.O. Box:1248  
Ajman Free Zone - UAE  
Tel./Fax +971 (0)6 7427339  
www.siadmi.com - siadmi\_me@e.siad.eu  
GPS: N 25 24.47 - E 55 27.12

### ESA S.p.A.

Via Fermi, 40  
I-24035 CURNO (BG)  
Tel. +39 035 6227411 - Fax +39 035 6227499  
www.esapyronics.com - esa@esacombustion.it  
GPS: N 45 41.11 - E 9 37.19

### Pyronics International S.a.

Zoning Industriel, 4eme rue  
B-6040 JUMET  
Tel. +32 71 256970 - Fax +32 71 256979  
www.esapyronics.com - marketing@pyronics.be  
GPS: N 50 27.15 - E 4 27.15

### ESA Manufacturing Pvt. Ltd.

Plot No. J - 244, MIDC, Bhosari  
IN-411 026 PUNE  
Tel. +91 9822601452  
www.esapyronics.com - esaindia@esapyronics.com  
GPS: N 18 38.41 - E 73 49.38

### TPI Tecno Project Industriale S.r.l.

Via Fermi, 40  
I-24035 CURNO (BG)  
Tel. +39 035 4551811 - Fax +39 035 4551895  
www.tecnoproject.com - tpi@tecnoproject.com  
GPS: N 45 41.11 - E 9 37.19

### PENTATEC S.r.l.

Via Aldo Moro, 7  
I-24035 CURNO (BG)  
Tel. +39 035 461673 - Fax +39 035 6222647  
www.pentatecsrl.com - commerciale@pentatecsrl.com  
GPS: N 45 41.06 - E 9 37.17

### TPI Tecno Project Industriale Ltda

Rua Pais de Gales, 161  
Dist. Ind. Bandeirantes  
SALTO - SP - CEP 13.326-195  
Tel./Fax +55 11 40215654  
www.tecnoproject.com.br - tpi@tecnoproject.com.br  
GPS: S 23 11.32 - W 47 19.08

## Healthcare

### MEDIGAS ITALIA S.r.l.

Via Edison, 6  
I-20090 ASSAGO (MI)  
Tel. +39 02 4888111 - Fax +39 02 48881150  
www.medigas.it - info@medigas.it  
GPS: N 45 24.17 - E 45 24.17

### MAGALDI LIFE S.r.l.

Via Case Rosse, 19/a  
I-84131 SALERNO  
Tel. +39 089 383004 - Fax +39 089 3856367  
www.magaldilife.it - info@magaldilife.it  
GPS: N 40 38.42 - E 14 51.52

### SIAD Healthcare S.p.A.

Via Edison, 6  
I-20090 ASSAGO (MI)  
Tel. +39 02 457921 - Fax +39 02 48843380  
www.siadhealthcare.com - info@siadhealthcare.com  
GPS: N 45 24.18 - E 9 07.22

## Istrabenz Plini Group

### SLOVENIA

ISTRABENZ PLINI d.o.o.  
Sermin 8/a  
SLO-6000 KOPER  
Tel. +386 (5) 6634600 - Fax +386 (5) 6634699  
www.istrabenzplini.si - info@istrabenzplini.si  
GPS: N 45 33.10 - E 13 45.53

### BOSNIA AND HERZEGOVINA

ISTRABENZ PLINI d.o.o.  
Potkraj bb  
BIH-71370 BREZA  
Tel. +387 32 789301 - Fax +387 32 789302  
GPS: N 44 00.17 - E 18 15.1

### CROATIA

ISTRABENZ PLINI d.o.o.  
Pristanište Podbok 3  
HR-51222 BAKAR (RIJEKA)  
Tel. +385 (51) 455300 - Fax +385 (51) 761175  
www.istrabenzplini.hr - istrabenzplini@istrabenzplini.hr  
GPS: N 45 17.37 - E 14 33.54

### SERBIA

ISTRABENZ PLINI d.o.o.  
Despota Stefana, 12  
SRB-BEOGRAD  
Tel. +381 113340949 - Fax +381 113341199  
GPS: N 44 48.59 - E 20 27.47

© 2017 Tecno Project Industriale S.r.l.  
All rights reserved

The information, images and data contained herein are published for information purposes only. According to product technical development, Tecno Project Industriale S.r.l. reserves the right to modify the contents of this document without prior notice.

Printed in Italy  
001UK10/17



Tecno Project Industriale S.r.l.  
Società unipersonale soggetta all'attività di direzione e coordinamento di SIAD S.p.A.  
24035 Curno (BG), Italy - Via E. Fermi, 40  
Capitale Sociale € 1.000.000 i.v.  
P. IVA, C. F., Reg. Impr. Bg 01070500168  
R.E.A. Bergamo 237676 - Export: BG012873

Telefono +39 035 4551 811 - 845 - 813  
Fax +39 035 4551 895  
info@tecnoproject.com

www.tecnoproject.com