

PRISM[®] PB4050

Biogas membrane separator



A typical membrane separator contains thousands of fibers, which are bundled and encased at both ends in epoxy resin. The ends of the bundles are cut, which leaves the fiber bores open on both ends, allowing the gas to travel from one end to the other. The bundles of fibers are enclosed in a suitable casing which protects the fibers and routes the gas properly.

Air Products' PRISM membranes: unequalled experience, performance, and value.

Air Products PRISM PB Membrane separators are a cost effective way to produce a continuous stream of bio-methane on site. Using only compressed biogas, these robust assemblies use selective permeation to separate methane molecules from carbon dioxide, oxygen, and water vapor. The resulting stream of methane is purified and dry, ready for use in most CNG applications.

Purity and volumes are controlled by adjusting the incoming pressure and temperature. Higher purity is achieved by increasing the number of separators in series. Increased output volumes are achieved by adding parallel separators. This scalability allows for flexibility in your system's production loading.

Features/benefits

Durability included

The PB4050 Membrane separator is manufactured from durable ABS and encased in high-strength aluminum, which can withstand some of the most grueling environments. Many of our separators see service cycles longer than ten years in continuous operation.*

Flexible application

PRISM PB Membrane separators are available with either high-flux fiber or high-selectivity fiber. By being able

to choose the level of productivity at each stage of separation, our engineers can optimize your biogas system to meet specific performance goals with the most efficient configuration. PRISM PB Membrane separators can be mounted vertically or horizontally to meet your design requirements. PRISM PB Membrane separators are available with a variety of connection ports and can be mounted vertically or horizontally to meet your design requirements.

Quality assured

Every membrane separator has to pass our rigorous testing requirements before it will be released into service. You can be confident that every unit will perform as advertised. Our quality program is AS9100 certified meeting the exacting standards of the global aerospace industry.

Industrial grade

PRISM Membrane separators are designed to handle industrial production loads. Pressures up to 16.2 BARG ensure that your biogas production requirements will be met. The solid construction is a perfect match for remote and severe duty installations.

Passive technology

The selective permeation technology is passive and has no moving parts. The simplicity of membrane equipment provides flexibility in system design.

Simple start up

PRISM Membrane separators are easily commissioned. Simply apply compressed gas, and production begins. No break-in period, expensive consumable media, or complex equipment to manage and maintain.

Lightweight

Weighing only 24.4 kg, the PB4050 separators are easily handled by one person, making installation and field service simple.

Performance Specifications*

High Methane Recovery Configuration

		Raw biogas	Biomethane	Vent
Composition				
Methane	mol%	55.0	98.0	0.3
Carbon Dioxide	mol%	45.0	2.0	99.7
Flow PB4050P3	nm ³ /hr	23.0	13.0	10.0
Pressure	barg	12.0	11.8	0

Power = 0.22 kW/nm³/hr raw biogas
Methane recovery = 99.8%

Low Power Configuration

		Raw biogas	Biomethane	Vent
Composition				
Methane	mol%	55.0	98.0	0.3
Carbon Dioxide	mol%	45.0	2.0	99.7
Flow PB4050P3	nm ³ /hr	46.4	24.4	21.9
Pressure	barg	12.0	11.8	0

Power = 0.15 kW/nm³/hr raw biogas
Methane recovery = 94%

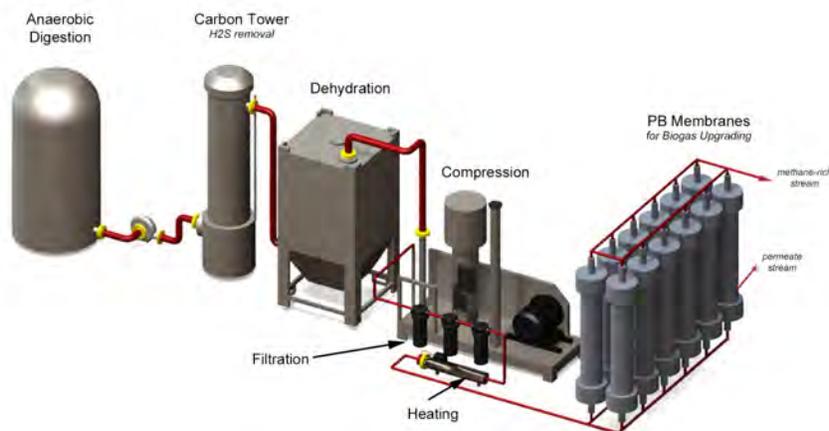
Low Power Configuration

		Raw biogas	Biomethane	Vent
Composition				
Methane	mol%	55.0	98.0	0.3
Carbon Dioxide	mol%	45.0	2.0	99.7
Flow PB4050N1	nm ³ /hr	135.3	68.4	67.0
Pressure	barg	12	11.8	0

Power = 0.17 kW/nm³/hr raw biogas
Methane recovery = 90%

* Higher purity is achieved by adjusting pressure and temperature, while flow volume is increased by connecting modules in parallel.

Our Technical Services team can run computer simulations to determine the optimum configuration of membrane separators for your system's feed characteristics. Please contact our office with the feed stream gas composition (flow/pressure/purity) and the desired output gas requirements.



Typical Biogas Upgrading System
Not to scale

Feed gas requirements

The compressed biogas should be treated to remove any condensed liquids, entrained mists, siloxanes, sulfur dioxide, and solid particulates before entering the membrane separator. Occasionally vapor phase contaminants will also have to be removed from the feed stream. The degree of cleanup required depends upon the particular contaminants present and the effects of those contaminants will have on the performance and lifetime of the membrane separator. Pretreatment steps typically include cooling, filtration, and final temperature and/or pressure control.

Mechanical Design Limits

Design pressure	18.0 BARG
Design temperature	65.6°C
MDMT	-15°C

Operating Limits

Pressure	16.2 BARG
CO ₂ Partial Pressure limit	13.8 BARG@25°C
Temperature Max (feed gas)	65.6°C
Temperature Min (feed gas)	5.0°C

Materials

Shell tube	6061-T6 Aluminum
End caps	6061-T6 Aluminum

Weight | Dimensions

Length	1629.2 mm
Diameter	184.1 mm
Weight	24.4 kg

Ordering Information

Catalog Number	Model Number	Product Description
456243	PB4050-N1-6G-0B	PRISM PB separator with high-flux membranes, ¾ inch BSPP connection and ¾ inch BSPP permeate port connection
456244	PB4050-N1-9H-0C	PRISM PB separator with high-flux membranes, ¾ inch tube size SAE O-Ring port connection and ¾ inch tube size SAE O-Ring port permeate port connection
456245	PB4050-P3-6G-DB	PRISM PB separator with high-selectivity membranes, ¾ inch BSPP connection and ¾ inch BSPP permeate port connection
456246	PB4050-P3-9H-DC	PRISM PB separator with high-selectivity membranes, ¾ inch tube size SAE O-Ring port connection and ¾ inch tube size SAE O-Ring port permeate port connection

WARNINGS:

Gaseous methane is colorless, odorless, tasteless, non-corrosive, and flammable. Methane is toxic and can act as an asphyxiant by displacing the necessary amount of oxygen in the air to sustain life (a minimum of 19% oxygen is required for life support). Safety procedures must be established and followed before entering any enclosed or poorly ventilated area containing methane generating equipment or piping. The methane gas generated by the membrane cannot support life.

The waste gas stream of the PB membrane is carbon-dioxide enriched with methane concentrations as high as 12% and may also contain traces of hydrogen sulfide, which is poisonous. All waste streams must be vented outdoors into an area which minimizes contact with personnel and equipment, to a minimum of 12 feet (3.7 meters) above grade. The waste gas must be flared or vented away from enclosures, areas with inadequate air circulation, or combustion sources.



For more information regarding Air Products' PRISM membrane products, please contact our Customer Service department.

Air Products PRISM Membranes

11444 Lackland Road
Saint Louis, Missouri 63146 USA
T 314-995-3300
F 314-995-3500
Membrane@airproducts.com
or visit airproducts.com/membranes

Permea China LTD

60 Jinshajiang Road
Shandong, 264006 China
T +86-535-2165333
F +86-535-2165336
fungp@airproducts.com
or visit airproducts.com/membranes

Air Products Japan K.K.

4F, Shinagawa East One Tower,
2-16-1 Konan, Minato-Ku,
Tokyo, Japan 108-0075
T +81-3-6890-8330
F +81-3-6890-8266
higucht@airproducts.com
or visit airproducts.co.jp

PED Certification

The quality system of Air Products Prism Membranes has been assessed and found to comply with respect to the conformity assessment procedure described in ANNEX III MODULE D OF DIRECTIVE 97/23/EC ON PRESSURE EQUIPMENT. This certificate is valid for Pressure Vessels: Membrane Gas Separators PB6050, PB4050, PB4030.



ISO 9001 and AS9100 Certification

Air Products Prism Membranes has been found to conform to the Management System Standard: ISO 9001:2008 and AS9100C (technically equivalent to EN 9100:2009 and JISQ 9100:2009) and has been audited in accordance with the requirements of AS9104/1:2012. Essential functions include the design, development and manufacture of hollow fiber membrane separators for the aerospace, air compression, oil and gas, petrochemical and other related industries.



Air Products Prism Membranes markets PB membrane separators through a network of value-added-resellers that we call our Preferred Partners. If you have an interest incorporating our membrane separators into your engineered systems, please contact our Business Development specialists. We look forward to working with you.

The information contained in this document is believed to be true and accurate at time of publication. Air Products PRISM Membranes reserves the right to change product specifications without notification. Please consult current *Product Design and Reference* manual for detailed information associated with these products.

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