

# PSA type Nitrogen Gas Generator

## **BELLSWING**<sup>®</sup>

General Catalog



Space-saving and energy-saving NSP type

# With high-performance MSC of AIR WATER BELLPEARL technology, We provide inexpensive nitrogen gas.

# TER BELLPEARL, and its systemization

# N<sub>2</sub> SYSTEM

**Compact design**  
(Package type)

- Small installation space
- It can be used only by connecting power and piping (no need for cooling water)

**Energy-saving design**

- Use of high performance adsorbent (MSC) with independency developed
- Application of energy-saving functions (Eco-Turn and Eco-Pressure)

**High performance design**

- 95 to 99.999% nitrogen is supplied at low cost.

**High safety**

- Exemption from High Pressure Gas Safety Act
- Adoption of drain sensor

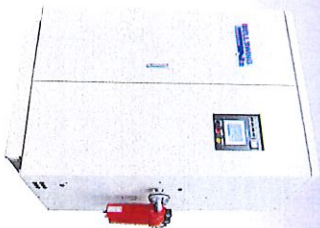
**Excellent operability**

- Full automatic unmanned operation
- Quick startup
- Scheduled operation for 1 week (S type, NSP type, and BPN type)
- Adoption of touch panel
- Adoption of pneumatic actuated valve

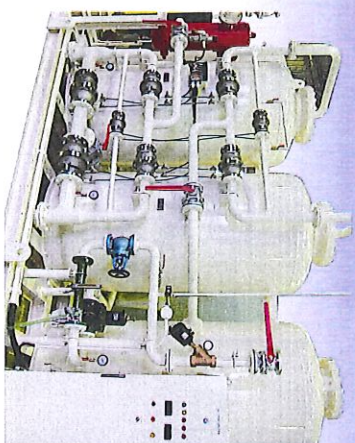
## Features of AIR WATER BELLPEARL



Small size BPN type



Medium size NSP type



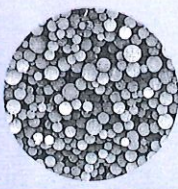
Large size open type

## Features of MSC

- Excellent homogeneity using particulate phenol resin (BELLPEARL)
- Large oxygen adsorption capacity and excellent oxygen/nitrogen separation performance
- Excellent durability with high strength and abrasion-resistant performance.



Photo of MSC appearance

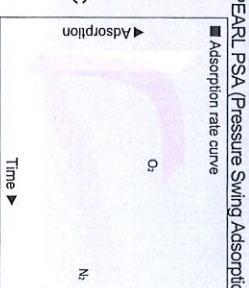


Electron microscope photo of BELLPEARL

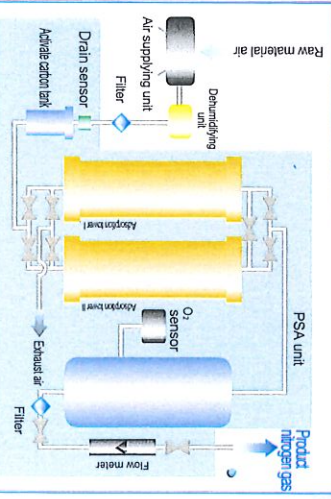
## Principle of PSA

AIR WATER BELLPEARL MSC (Molecular Sieving Carbon. Refer to the photo.) adsorbs oxygen on a priority base under high pressure in a short time, and separates nitrogen from air because of its large oxygen adsorption capacity and large difference in adsorption rate between oxygen and nitrogen. The adsorbed oxygen is easily desorbed by restoring to normal pressure to reproduce MSC.

AIR WATER BELLPEARL PSA (Pressure Swing Adsorption) generates high-purity nitrogen gas continuously, by repeating adsorption and desorption alternately in a cycle matched with the MSC characteristic, while filling 2 adsorption towers with MSC.



## Flow sheet



## Main use of PSA

- **Electronic field**  
Soldering under an oxygen-free atmosphere (N<sub>2</sub> flow and yellow), joining, drying, sealing and oxidation prevention of semiconductors, electronic parts, etc.
- **Metal field**  
Stainless steel cutting by laser beam machine, and electric-wire drawing.
- **Food field**  
Gas filling package of nuts, tea, coffee, etc., preservation of dry foods, oxidation prevention of oil and fat, storage of wine and beer, and CA storage of fruit and vegetables.
- **Chemical industry field**  
Heat treatment of metal, ceramic, etc., burning tank, reaction tank and sealing in general chemical industry, molding and drying of resin, and purging.
- **Research & development field**  
Analysis and experiment (sealing and carrier gas), and pilot plant.

## PSA Nitrogen Gas Generator BELLSWING®

### Overview

A lineup of the space-saving / energy-saving PSA nitrogen generators designed under the same concept as that of the popular SP type. With better energy-saving performance, they can significantly save running costs at the same time being compact and friendly to the environment.

### Features

#### Energy-saving

- Incorporated with the newly-developed high-performance MSC and a special pressure equalization method. (License acquired through technical collaboration: MB-PT method)
- Up to 33% in reduced power consumption with significant decreases in raw material air. (Sizes of applicable compressors are reduced by one level)
- Suppressed CO<sub>2</sub> emission.
- Operation that requires even less energy due to the use of the inverter compressor. (ECOTURN method: Equipped with N<sub>2</sub> flow rate detecting energy-saving device)

#### Space-saving

- They have remained compact and are the energy-saving models that require the smallest spaces in the industry.
- Significantly-decreased maintenance space

#### Lower costs and better convenience

- Improvements on the previous processors along with the adoption of a highly-reliable air drive valve.
- The maintenance cycle has been extended by 1.5 times.
- It is compatible with universal compressors (0.7 MPaG) (excludes some models).
- Improvements in areas such as controlling functions with the unification of operating data. (Equipped with advanced touch panel and various sensors.)

Space-Saving / Energy-Saving **NSP** Type

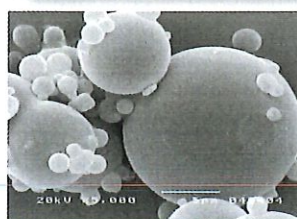
- Up to 33% in reduced power consumption!
- Suppressed CO<sub>2</sub> emission!
- An improved variety of controlling functions!



### The newly-developed high-performance MSC

The new high-performance MSC has been developed with ultrahigh precision micro-pore formation technology. It also features porous material manufacturing technology that has been cultivated after many years of improvements, including at the raw materials level, and has separation efficiency that has achieved the highest levels in the industry.

#### Electron micrograph of spherical phenol resin



Conventional products (×5000)



Newly-developed product (×5000)

### Benefits of use

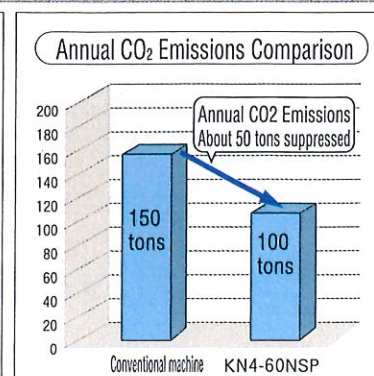
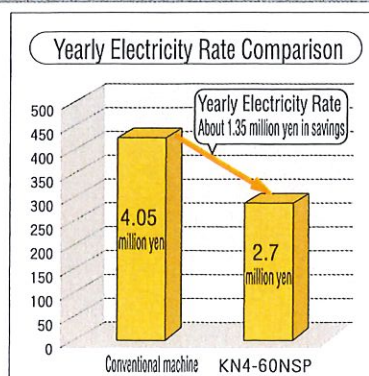
If the KN4-60NSP is introduced, the yearly electricity bill can be decreased by about 1.35 million yen, and annual CO<sub>2</sub> emissions can be decreased by 50 tons.

(Our SP comparison)

\*Calculation conditions: 15 yen/kWh, operation of 6000 hours/year

\*CO<sub>2</sub> emission is 0.555kg to CO<sub>2</sub>/kWh

Figures based on Article 3 of the Order for Enforcement of the Promotion of Global Warming Countermeasures.



## PSA Nitrogen Gas Generator BELLSWING® Space-Saving / Energy-Saving NSP Type

### 99.99% N<sub>2</sub> Series

Model	N <sub>2</sub> Gas Purity (%)	N <sub>2</sub> Gas Amount of Generation (Nm <sup>3</sup> /hr)	N <sub>2</sub> Gas Pressure (MPaG)	Power specifications Power consumption	Measurements of main body (W×D×H) (mm)	Mass (kg)	Applicable compressors Output (kW)
KN4-13NSP	99.99	13	0.5	Single phase	1,080×700×1,700	670	7.5
KN4-20NSP		20		AC100	1,200×750×1,800	850	11
KN4-30NSP		30		to 240V	1,360×850×1,900	1,400	15
KN4-40NSP		40		50/60Hz	1,700×1,030×1,900	1,650	22
KN4-60NSP		60			1,800×1,150×1,920	1,900	30
KN4-80NSP		80			1,650×1,650×2,100	2,700	45
KN4-100NSP		100			0.2kW	1,650×1,770×2,100	3,000
KN4-140NSP		140			1,650×1,770×2,400	3,500	75 *1

### 99.9% N<sub>2</sub> Series

Model	N <sub>2</sub> Gas Purity (%)	N <sub>2</sub> Gas Amount of Generation (Nm <sup>3</sup> /hr)	N <sub>2</sub> Gas Pressure (MPaG)	Power specifications Power consumption	Measurements of main body (W×D×H) (mm)	Mass (kg)	Applicable compressors Output (kW)
KN3-16NSP	99.9	16	0.5	Single phase	1,080×700×1,700	670	7.5
KN3-25NSP		25		AC100	1,200×750×1,800	850	11
KN3-35NSP		35		to 240V	1,360×850×1,900	1,400	15
KN3-50NSP		50		50/60Hz	1,700×1,030×1,900	1,650	22
KN3-70NSP		70			1,800×1,150×1,920	1,900	30
KN3-100NSP		100			1,650×1,650×2,100	2,700	45
KN3-130NSP		130			0.2kW	1,650×1,770×2,100	3,000
KN3-180NSP		180			1,650×1,770×2,400	3,500	75 *1

### 99% N<sub>2</sub> Series

Model	N <sub>2</sub> Gas Purity (%)	N <sub>2</sub> Gas Amount of Generation (Nm <sup>3</sup> /hr)	N <sub>2</sub> Gas Pressure (MPaG)	Power specifications Power consumption	Measurements of main body (W×D×H) (mm)	Mass (kg)	Applicable compressors Output (kW)
KN2-20NSP	99	20	0.5	Single phase	1,080×700×1,700	670	7.5
KN2-30NSP		30		AC100	1,200×750×1,800	850	11
KN2-45NSP		45		to 240V	1,360×850×1,900	1,400	15
KN2-65NSP		65		50/60Hz	1,700×1,030×1,900	1,650	22
KN2-100NSP		100			1,800×1,150×1,920	1,900	30
KN2-130NSP		130			1,650×1,650×2,100	2,700	45
KN2-170NSP		170			0.2kW	1,650×1,770×2,100	3,000
KN2-240NSP		240			1,650×1,770×2,400	3,500	75 *1

\*Nitrogen gas purity is described as rates of nitrogen gas, argon gas, etc., by volume.

\*Performance, power sources, and pressure vessel specifications may vary depending on shipping destinations overseas, so please contact us for any details regarding this issue.

\*Specifications and dimensions of the devices may change without notice due to upgrades and improvements.

\*The amount of N<sub>2</sub> generation and N<sub>2</sub> pressure changes with the raw material air pressure. Please use compressed air that is of the highest pressure possible. (\*1: Supports raw material air of 0.93 MPa)

\*Ambient temperature range: 5 to 30°C.

## PSA type nitrogen gas generator BELLSWING® BPN2 type

### Application fields

- ◆ Food / Chemicals / Cosmetics (99.9%)
- ◆ Antioxidation and wettability improvement of solder (99.9% to 99.99%)
- ◆ Heat treatment of metal (99.99%)
- ◆ Antioxidation and quality improvement during resin molding (99.9%)
- ◆ Chemical reaction suppressing gas (99.9% to 99.99%)
- ◆ Explosion prevention gas (95% to 99%)
- ◆ Deoxygenated water generation (99.9%)



### Features



## BPN2-33W

- ◆ The size has been reduced to an average of 50% of that of the conventional products, due to high-performance adsorbent. (Able to be installed in a space from 42 cm in width)
- ◆ Nitrogen gas can easily be generated using plant air as a raw material. Select the specification to suit your need.
- ◆ Operability and visibility have been improved by adopting a large-sized touch panel.
- ◆ It can be set to the energy-saving control (eco.turn) operation or standard operation.
- ◆ The operating condition data from daily inspection, etc. can automatically be recorded in an SD card.
- ◆ An industry's first model with supplier's declaration of conformity with CE-Marking is also lined up.

### Basic lineup and product specification

Model	Nitrogen gas specification	Main unit dimensions (mm)			Mass (kg)	Power consumption	Inlet/outlet size
		Width	Depth	Height			
BPN2-11W	Refer to the performance specification calculation table on the back.	400	630	1,233	120	Single phase AC100~240V 50/60Hz 0.15kW	Rc3/8
BPN2-22W		400	785	1,233	175		
BPN2-33W		400	940	1,233	220		
BPN2-44H		460	870	1,550	320		
BPN2-66H		460	1,050	1,550	380		

### Options

Symbol	Name	Standard	Selection
A	Mist filter	N/A	0.01 $\mu\text{m}$ filter for the oil mist in raw air, etc.
B	Activated carbon tank	N/A	It removes the oil and odor, etc. in raw material air. It protects adsorbent.
C1/C2	Low/high concentration oxygen sensor	Measurement range: 0.05% to 1%	Measurement range: C1: Low concentration 0.005% to 0.1% / C2: High concentration 0 to 25%
F	Sterilization filter	N/A	Filtration rating: 0.003 $\mu\text{m}$ . Use in food field, etc. (A product filter with filtration rating of 0.3 $\mu\text{m}$ is equipped.)

\* Representative options are listed above. Contact us separately for any other request.



**Performance specification calculation table Nitrogen / Air (Sl/min) Model BPN2-11W**

Air pressure (MPaG)		0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	
Nitrogen gas purity Vol% (N <sub>2</sub> +Ar)	95	Nitrogen	64	71	77	83	90	96	103	109	115
		Air	136	150	164	177	191	205	218	232	246
	99	Nitrogen	45	50	54	59	64	68	73	77	82
		Air	120	132	143	155	167	179	191	203	215
	99.9	Nitrogen	26	29	32	34	37	39	42	45	47
		Air	99	109	119	129	139	148	158	168	178
	99.99	Nitrogen	15	17	18	20	21	23	24	26	27
		Air	82	90	98	107	115	123	131	139	148
Maximum nitrogen pressure (MPaG)		0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.62	0.66	

**Performance specification calculation table Nitrogen / Air (Sl/min) Model BPN2-22W**

Air pressure (MPaG)		0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	
Nitrogen gas purity Vol% (N <sub>2</sub> +Ar)	95	Nitrogen	128	141	154	167	180	192	205	218	231
		Air	273	300	327	355	382	409	437	464	491
	99	Nitrogen	91	100	109	118	127	136	145	154	163
		Air	239	263	287	311	335	359	383	406	430
	99.9	Nitrogen	53	58	63	68	74	79	84	89	95
		Air	198	218	238	257	277	297	317	337	356
	99.99	Nitrogen	30	33	36	39	42	45	48	51	54
		Air	164	180	197	213	229	246	262	279	295
Maximum nitrogen pressure (MPaG)		0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.62	0.66	

**Performance specification calculation table Nitrogen / Air (Sl/min) Model BPN2-33W**

Air pressure (MPaG)		0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	
Nitrogen gas purity Vol% (N <sub>2</sub> +Ar)	95	Nitrogen	192	212	231	250	269	289	308	327	346
		Air	409	450	491	532	573	614	655	696	737
	99	Nitrogen	136	150	163	177	192	204	218	231	245
		Air	359	395	430	466	502	538	574	610	646
	99.9	Nitrogen	79	87	95	102	110	118	126	134	142
		Air	297	327	356	386	416	445	475	505	535
	99.99	Nitrogen	45	50	54	59	63	68	72	77	81
		Air	246	270	295	320	344	369	393	418	443
Maximum nitrogen pressure (MPaG)		0.31	0.34	0.38	0.42	0.46	0.49	0.53	0.57	0.61	

**Performance specification calculation table Nitrogen / Air (Sl/min) Model BPN2-44H**

Air pressure (MPaG)		0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	
Nitrogen gas purity Vol% (N <sub>2</sub> +Ar)	95	Nitrogen	256	282	308	333	359	385	410	436	462
		Air	546	600	655	709	764	819	873	928	982
	99	Nitrogen	181	200	218	236	254	272	290	308	327
		Air	478	526	574	622	670	717	765	813	861
	99.9	Nitrogen	111	122	133	144	155	166	177	188	199
		Air	396	436	475	515	554	594	634	673	713
	99.99	Nitrogen	63	70	76	82	89	95	101	108	114
		Air	328	361	393	426	459	492	525	557	590
Maximum nitrogen pressure (MPaG)		0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.62	0.66	

**Performance specification calculation table Nitrogen / Air (Sl/min) Model BPN2-66H**

Air pressure (MPaG)		0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	
Nitrogen gas purity Vol% (N <sub>2</sub> +Ar)	95	Nitrogen	385	423	462	500	539	577	615	654	692
		Air	819	900	982	1064	1146	1228	1310	1392	1473
	99	Nitrogen	261	287	313	339	365	391	417	443	469
		Air	717	789	861	933	1004	1076	1148	1219	1291
	99.9	Nitrogen	166	182	199	216	232	249	265	282	299
		Air	594	653	713	772	831	891	950	1010	1069
	99.99	Nitrogen	95	104	114	123	133	142	152	161	171
		Air	492	541	590	639	688	738	787	836	885
Maximum nitrogen pressure (MPaG)		0.31	0.34	0.38	0.42	0.46	0.49	0.53	0.57	0.61	

Note: \* The above values represent approximate gas quantity (on the basis of atmospheric pressure at 20°C). Contact our business counter separately for any other conditions.  
 \* Select the model in reference to the above table for some extra value in advance.  
 \* The specification and dimensions of the generator are subject to change without prior notice, for the purpose of improvement.  
 \* The nitrogen gas pressure at each purity shall be [Maximum nitrogen pressure x Pressure coefficient] or less. Pressure coefficient: 95% = 0.9, 99% = 0.95, 99.9% or more = 1.0

**For inquiry, inform us of the following items.**

- |                             |                           |
|-----------------------------|---------------------------|
| ① Nitrogen gas purity       | (%)                       |
| ② Nitrogen gas flow rate    | (Nm <sup>3</sup> /H)      |
| ③ Nitrogen gas pressure     | (MPa)                     |
| ④ Operation time            | (hour/day)<br>(day/month) |
| ⑤ Introduction time         |                           |
| ⑥ Use                       |                           |
| ⑦ Current unit price of gas | (yen/m <sup>3</sup> )     |
| ⑧ Current power rates       | (yen/kWh)                 |
| ⑨ Other special notes       |                           |

**Our product line (3 major products).**

Functional particulate phenol resin  
**"BELLPEARL"**

It is the one and only functional particulate phenol resin in the world, which we independently developed. The primary particle diameter is 2 to 20 μm. It can be used in various applications, taking advantage of heat resistance and environmental safety.



Functional new carbon  
**"BELLFINE"**

It is a functional carbon material manufactured using BELLPEARL as a starting material (electrode material, molecular sieving carbon (MSC), activated carbon, etc.). It is used in various activated carbon applications.



PSA type nitrogen gas generator  
**"BELLSWING"**

It is a PSA type nitrogen gas generator using BELLFINE MSC (molecular sieving carbon). We roll out standardized auxiliary facilities and standardized models of various types of industrial equipment, which require nitrogen gas, including reflow furnaces, injection molding machines, laser processing, food packaging, metal working (wire drawing, etc.), chemical plants, etc.



● **Contact:**

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