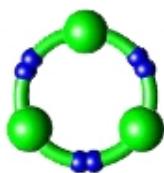


Distributed by:



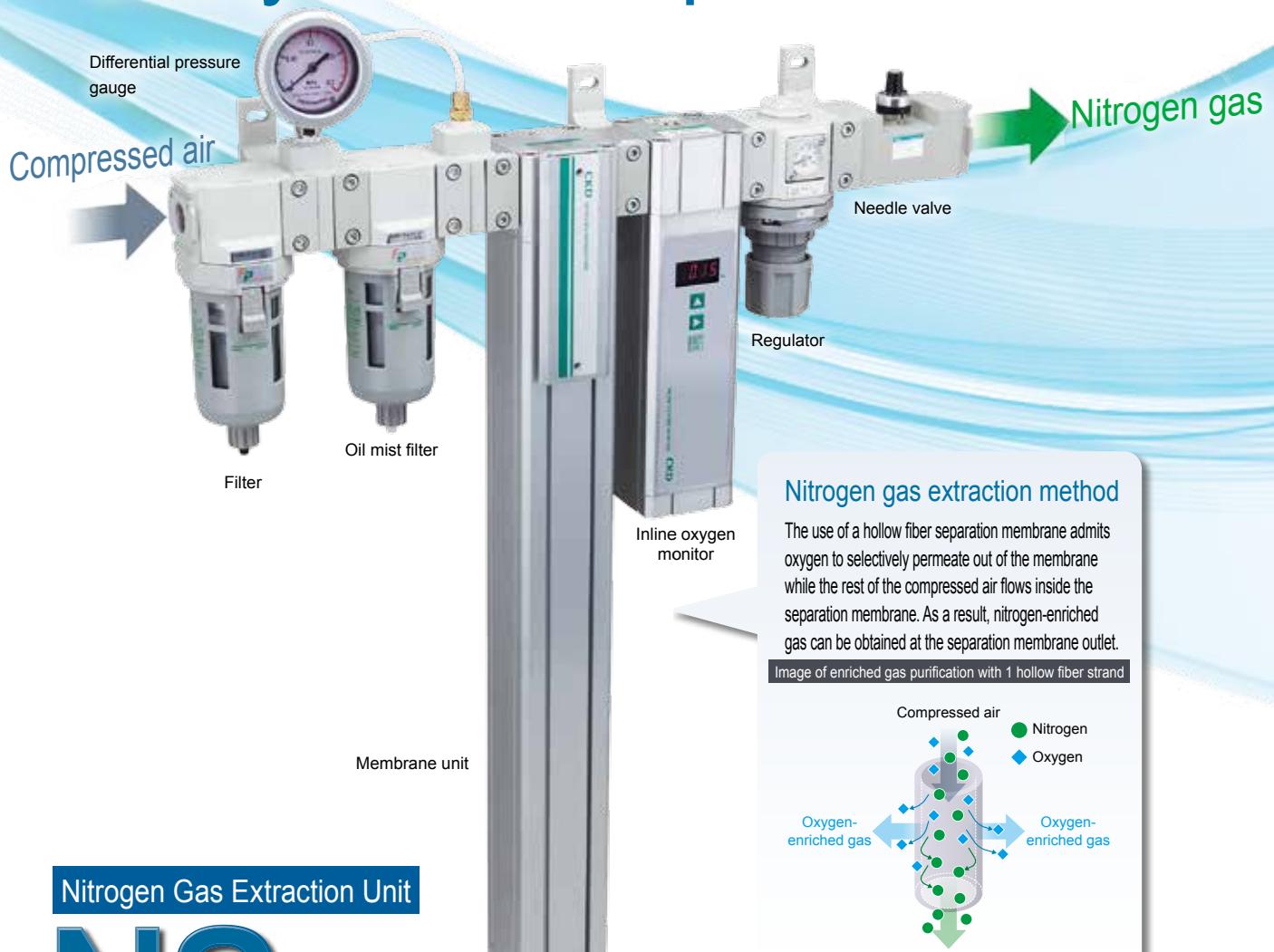
Manufacturing Support & Supplies Co.
8 Whatney, Suite100, Irvine, California 92618
Ph. (949)505-9981 sales@msscorporation.com

Nitrogen extracted from air

Nitrogen Gas Extraction Unit NS Series



Nitrogen gas can be extracted easily from compressed air.



Nitrogen Gas Extraction Unit

NS Series

NS Series configuration

System	Unit	
	Single cylinder	Multiple cylinders
NSU	NS	

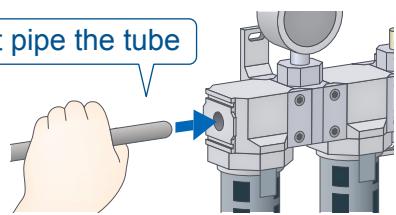
New

Install anywhere

Saves processes, piping, and space

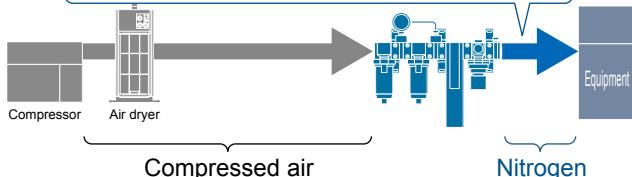
- With system components provided, design and piping are easy.
- The ideal system can be selected according to the required flow rate.
- Long piping work dedicated for nitrogen is unnecessary since it can be installed near equipment.

Just pipe the tube



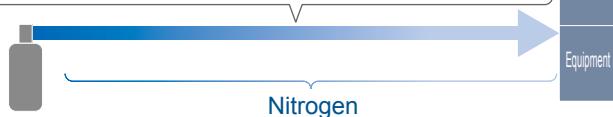
NS Series

Quick nitrogen concentration start up



Conventional method

Slow nitrogen concentration start up due to long piping



Power supply not required

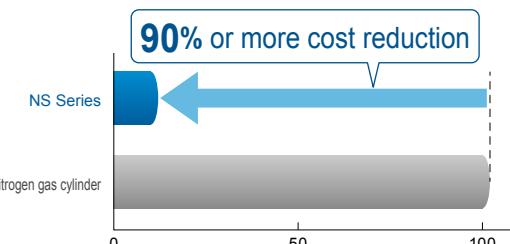
- Usable even in explosion-proof atmospheres, different voltage areas, etc.
 - No malfunctions due to electrical noise.
 - Quiet, with no heat generation as there is no drive system.
- *When selecting the Inline oxygen monitor (option), a power supply is required.

Low cost

Running cost reduction

- The only required maintenance cost is electricity for the air compressor.
- No continuous running costs such as cylinder refilling costs.

Nitrogen gas cylinder and gas unit price comparison



Expense reduction

- Troublesome cylinder management of remaining gases, or replacement work is not required.

Easy maintenance

Sustainable reliability

- Since there are no movable parts, stable performance can be maintained.
- Parts replacement is possible without disassembling the piping.



High Pressure Gas Safety Act not applicable

- There is no need for notifications or assignment of qualified personnel.

Compatible with FP Series for secure food manufacturing processes

Can be used safely in food manufacturing processes.

NSF H1
grease for
foodstuffs is used

Material compatible
with the Food Sanitation Act
Fluid passage section
Resin /rubber

FP
Food Process®

This logo mark stands for our brief
that CKD's safe products support food
manufacturing processes.

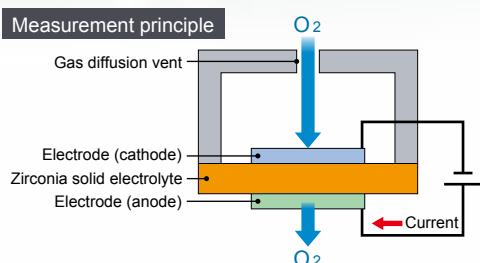
Oxygen concentration under pressure can be monitored



CE

Limit current method

The PNA Series uses the limit current method. When voltage is applied to the zirconia element, an ion current flows with oxygen ions as carriers. When the oxygen concentration changes, the current characteristics change proportionally, enabling detection of the oxygen concentration. This method is highly durable and offers a long service life.

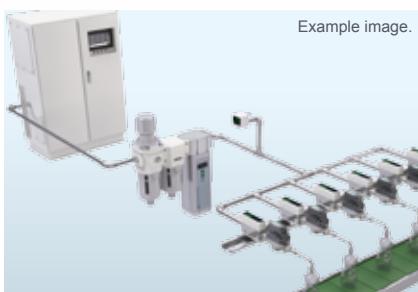


Inline Oxygen Monitor

PNA Series

Examples of applications

Terminal concentration check



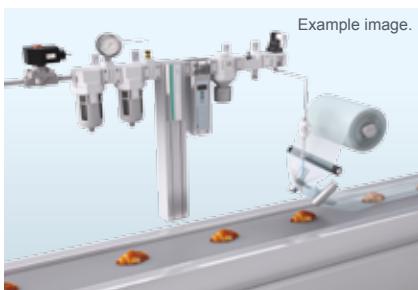
- Concentration check at start of work
- Normal concentration check
- Identification of maintenance timing

Concentration check for gas in explosion-proof areas



- Concentration check at start of work
- Normal concentration check
- Alarms for hazardous concentrations

Nitrogen filling concentration check



- Concentration check when filling nitrogen
- Concentration setting

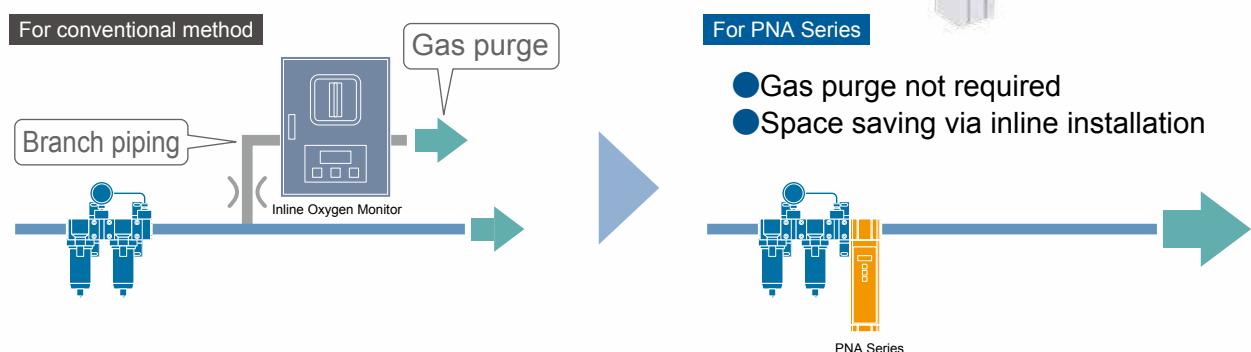
Checking gas for remaining oxygen removal



- Oxygen concentration check for removal gas
- Status monitoring

Saves energy, piping, and space

Realizing a pressure-resistant structure. The inline Modular structure saves piping space. Conventional gas purging is no longer necessary.



Easy to use

Oxygen/inert gas concentration display is switchable

- With 100-oxygen concentration, the inert gas concentration is clear at a glance.



Oxygen concentration display

Upper/lower limit switch output setting and analog output are available

- Alarms can be set for concentration changes, and status monitoring is possible.



With self-diagnostic function

- Keeps you posted about abnormalities in the detector element.

Degree of protection IP65 or equivalent

- Wet or dry, it still functions.



Inert gas concentration display

Pressure-resistant structure

- Usable at pressures from atmospheric pressure through 1.0 MPa.

Compatible with FP Series for secure food manufacturing processes

Can be used safely in food manufacturing processes.



This logo mark stands for our brief that CKD's safe products support food manufacturing processes.

CKD after-sales service

Traceability certificates (with traceability series variation diagram) can be issued.

The sensor of the oxygen concentration monitor may deteriorate depending on the working conditions. Therefore, regular calibration is required to maintain stable performance. For even longer consistent performance, we recommend the yearly calibration service.



Feel free to contact CKD for details on calibration and repair.

Usage examples

Packaging Gas-filled packaging

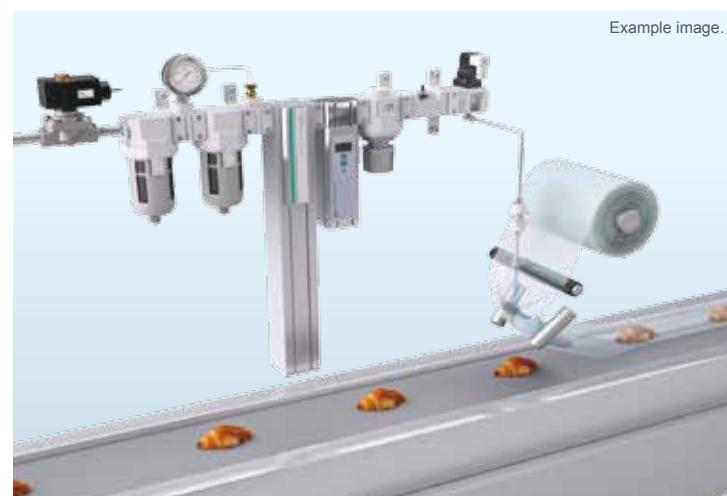
MAP (gas-filled) packaging essential for long-life food products. Fills and replaces with nitrogen-enriched gas to prevent the oxidative degradation of food.



Example image.

Packaging Gas-filled packaging

For pillow packaging, the container is filled with nitrogen gas to prevent oxidative degradation, discoloration, or fading, to preserve fragrance, and also to prevent the package from losing its shape.



Example image.

Food/chemicals Remaining oxygen removal

Removes oxygen gas dissolved in liquid by injecting nitrogen gas into the liquid.

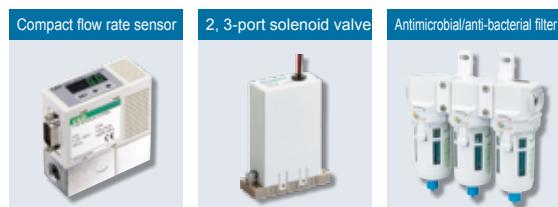


Example image.

Cultivation Low oxygen concentration management

Creates a low-oxygen environment preferred by cultivation samples by feeding nitrogen gas to the cultivation chamber.

Example image.



Machining/assembling Explosion-proof atmospheres

Prevents explosive gas or corrosive gas from entering the container by filling it with nitrogen gas, purging air, and using positive internal pressure.

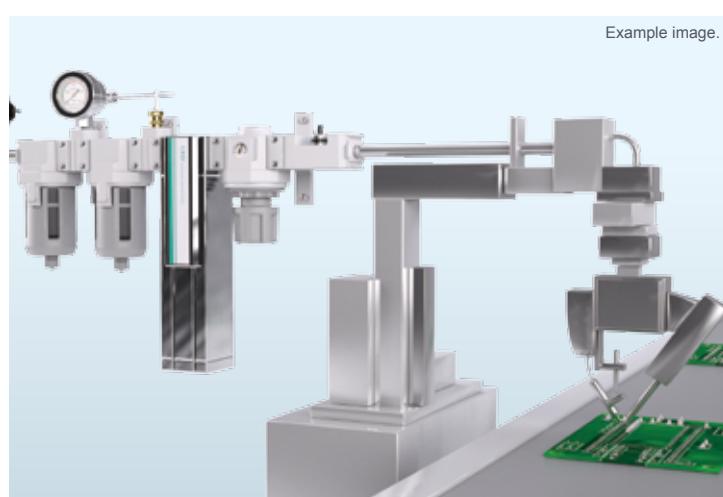
Example image.



Base Improved solder wettability

Improves lead-free solder wettability by blocking oxygen with nitrogen gas and preventing oxidation on the tip or surface of the soldering iron.

Example image.



■ System

Model No.	Appearance	Flow rate (L/min ANR) and nitrogen concentration (%)						
		10 L/min						
NSU-3S		99.9	99.5	99	98	97	96	95
NSU-3L		99.9		99.5		99		
NSU-4S		99.9					99.5	
NSU-4L		99.9						

■ Unit

Model No.	Appearance	Flow rate (L/min ANR) and nitrogen concentration (%)						
		10 L/min						
NS-3S1		99.9	99.5	99	98	97	96	95
NS-3L1		99.9		99.5		99		
NS-4S1		99.9					99.5	
NS-4L1		99.9						

Model No.	No. of units	Appearance	Flow rate (L/min ANR) and nitrogen concentration (%)				
			50 L/min	100	150		
NS-4S2	2		99.9	99.5	99	98	97
NS-4S3	3		99.9	99.5	99	98	97
NS-4L2	2		99.9	99.5	99	98	97
NS-4L3	3		99.9	99.5	99	98	97
NS-4S6	6		99.9	99.5	99	98	97
NS-4S8	8		99.9	99.5	99	98	97
NS-4SA	10		99.9	99.5	99	98	97
NS-4L6	6		99.9	99.5	99	98	97
NS-4L8	8		99.9	99.5	99	98	97

* The above value indicates the outlet nitrogen gas flow rate with inlet air pressure of 0.7 MPa and inlet air temperature of 25°C.

Flow rate (L/min ANR) and nitrogen concentration (%)									Page
20	40	60	80	100	120	140	160	180	
98	97	96	95						1
99	98	97	96	95					
99.5	99	98	97	96	95				
Flow rate (L/min ANR) and nitrogen concentration (%)									9
98	97	96	95						
99	98	97	96	95					
99.5	99	98	97	96	95				
Flow rate (L/min ANR) and nitrogen concentration (%)									9
300	450	600	750	900	1050	1200	1350	1500	
96	95								
98	97	96	95						
97	96	95							
98	97	96	95						
99	98	97	96	95					
99.5	99	98	97	96	95				
99.5	99	98	97	96	95				

Supplement:

Precisely, the indicated nitrogen concentration of nitrogen gas obtained from the nitrogen gas extraction unit indicates the sum of the concentration of the components excluding oxygen (O₂). The raw air contains argon, carbon dioxide, water vapor, etc. as well as nitrogen and oxygen. Therefore, the product nitrogen gas contains about 1% argon (which, like nitrogen, has difficulty permeating the membrane). The concentration of about 10 to 50 ppm of carbon dioxide, which permeates the membrane easily, decreases down to water vapor temperature -40°C at atmospheric dew point conversion.



Nitrogen Gas Extraction Unit, system

NSU Series

Easily and stably supplying nitrogen gas.

- Nitrogen gas is obtained just by piping to a pneumatic source.
- All in one design with superior installation performance.

Specifications

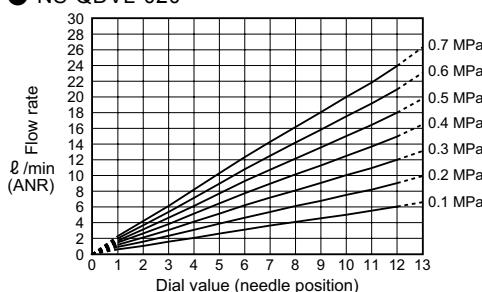
Descriptions		NSU-3S	NSU-3L	NSU-4S	NSU-4L	
Range of working conditions		Compressed air				
Inlet air pressure	MPa		0.4 to 1.0			
Proof pressure	MPa		1.5			
Inlet air temperature	°C		5 to 50			
Relative humidity of inlet air	RH		50%			
Ambient temperature	°C		5 to 50			
Inlet air pressure dew point	°C		10			
Inlet air pressure	MPa		0.7			
Inlet air temperature	°C		25			
Ambient temperature	°C		25			
Rated flow rate	Outlet nitrogen gas flow rate ℓ /min (ANR)	99.9 99 97 95	1.9 5.0 8.9 14.0	5.6 15.5 28.7 39.8	11.0 28.2 49.9 65.3	30.6 66.9 118.1 169.2
	Inlet air flow rate ℓ /min (ANR)	99.9 99 97 95	21.2 20.9 24.1 31.2	62.3 64.6 77.6 88.5	122.3 117.5 134.9 145.2	340.0 278.8 319.2 376.0
Air filter		Filtration μm		5		
Oil mist filter		Oil removal mg/m^3	0.01 or less (0.1 or less after oil saturation) * The measured value when primary oil concentration is 30 mg/m ³ at 21°C.			
Regulator		Set pressure range MPa		0.05 to 0.85		
Inline oxygen monitor			Refer to page 7 for the specifications.			
Needle valve		Flow characteristics	Refer to the graph below.			
Standard accessories			Pressure gauge/differential pressure gauge/bracket			

* Refer to the outlet nitrogen gas flow rate and needle valve flow characteristics (refer to the figure below) in order to check if the conditions are within the working range. Contact CKD if the working range is exceeded.

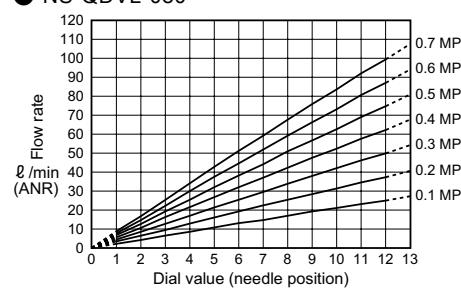
Needle valve flow characteristics

*The flow rate characteristics graph gives reference values and does not guarantee the values.

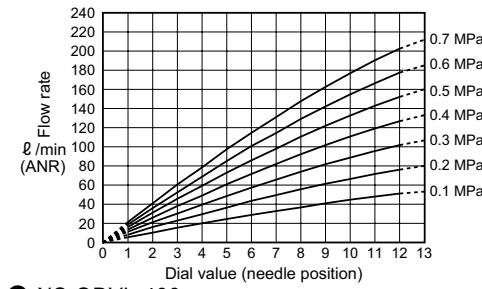
● NS-QDVL-020



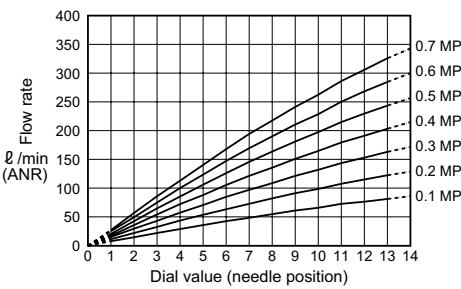
● NS-QDVL-080



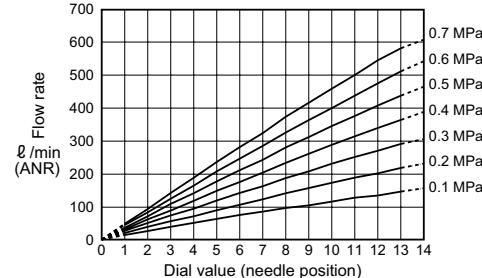
● NS-QDVL-160



● NS-QDVL-240



● NS-QDVL-400



Selection guide

As temperature and inlet air pressure affect outlet nitrogen gas flow rate, correction is required if they differ from the rated values listed in the specifications.

STEP 1 Confirm the working conditions.

- Outlet nitrogen gas flow rate [L/min (ANR)]
- Outlet nitrogen gas pressure [MPa]
- Inlet air pressure [MPa]
- Inlet air temperature [°C]

STEP 2 Confirm the compensation coefficient for outlet nitrogen gas flow rate affected by inlet air temperature.

(1) Temperature - Gas flow rate compensation coefficient

Temperature (°C)	Outlet nitrogen gas concentration			
	99.9%	99%	97%	95%
5	0.64	0.79	0.79	0.75
10	0.73	0.84	0.84	0.81
25	1	1	1	1
40	0.95	1.08	1.06	1.11
50	0.9	1.09	1.11	1.15

STEP 3 Confirm the compensation coefficient for outlet nitrogen gas flow rate affected by inlet air pressure.

(2) Pressure - Gas flow rate compensation coefficient

Pressure (MPa)						
0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.4	0.65	0.75	1	1.07	1.2	1.3

STEP 4 Find the appropriate body size and membrane unit size based on the rated outlet nitrogen gas flow rate of each model.

Rated outlet nitrogen gas flow rate x (1) Temperature gas flow rate compensation coefficient x (2) Pressure gas flow rate compensation coefficient = corrected refined nitrogen gas flow rate

Select the body size and membrane unit size with sufficient refined nitrogen gas flow rate after correction with the above formula.

STEP 5 From the outlet nitrogen gas flow rate, select the required needle and model

Based on the outlet nitrogen gas flow rate and the outlet nitrogen gas pressure confirmed in STEP 1, select the needle from the needle flow rate characteristics (P4)

STEP 6 Select the model from STEP 4 and STEP 5.

STEP 7 Confirm the compensation coefficient for inlet air flow rate affected by inlet air temperature.

(3) Temperature - Air flow rate compensation coefficient

Temperature (°C)	Outlet nitrogen gas concentration			
	99.9%	99%	97%	95%
5	0.73	0.68	0.75	0.69
10	0.8	0.76	0.81	0.77
25	1	1	1	1
40	1.32	1.25	1.17	1.2
50	2.05	1.38	1.31	1.31

STEP 8 Confirm the compensation coefficient for inlet air flow rate affected by inlet air pressure.

(4) Pressure - Air flow rate compensation coefficient

Pressure (MPa)						
0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.61	0.79	0.91	1	1.07	1.2	1.3

STEP 9 Find the inlet air flow rate from the rated outlet nitrogen gas flow rate of each model.

Inlet air flow rate of the model selected in STEP 5 x (3) temperature air flow rate compensation coefficient x (4) pressure air flow rate compensation coefficient = compensated inlet air flow rate

Based on the inlet air flow rate compensated as above, confirm whether the compressor capacity is sufficient.

Example of calculation

Conditions	Working conditions	Selecting conditions	Compensation coefficient for outlet nitrogen gas flow rate	Compensation coefficient for inlet air flow rate
Outlet nitrogen flow rate	50 [L/min(ANR)]	50 [L/min(ANR)]	-	-
Outlet nitrogen concentration	99 [%]	99 [%]	-	-
Outlet nitrogen pressure	0.2 [MPa]	0.2 [MPa]	-	-
Inlet air temperature	35 [°C]	40 [°C]	(1) 1.08	(3) 1.25
Inlet air pressure	0.6 to 0.7 [MPa]	0.6 [MPa]	(2) 0.75	(4) 0.91

Calculate the following and select according to the above conditions.

From the formula $50 \text{ (outlet nitrogen gas flow rate)} \div 1.08 \div 0.75 = 61.7 \text{ [l/min(ANR)]}$, the specification field shows that NSU-4L has sufficient flow rate and is the proper size.

For needle size, select NS-QDVL-160 at 0.2 [MPa], which can be adjusted at 50 [L/min (ANR)].

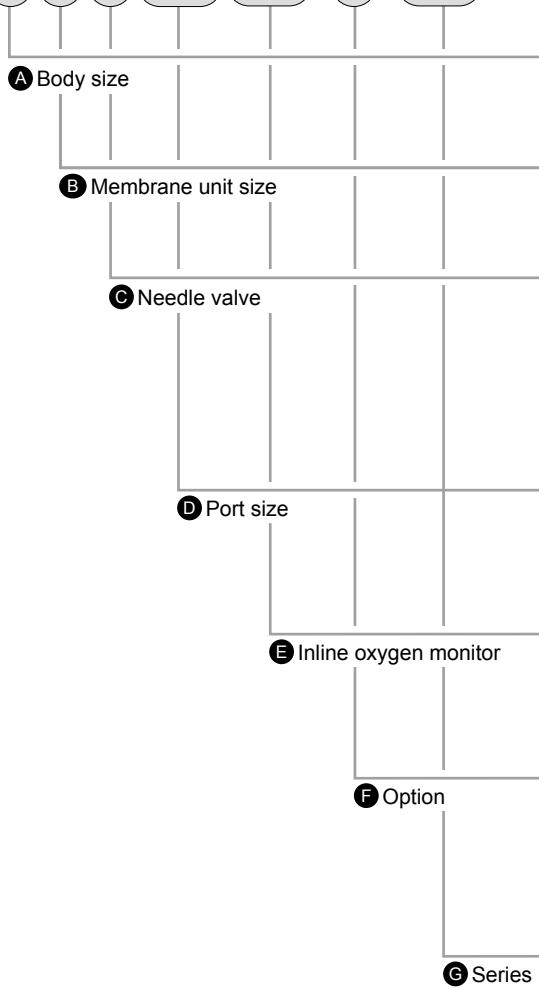
This enables the selection of "NSU-4LC10AAK-N".

In this case, the inlet air flow rate is calculated as: $278.8 \times 1.25 \times 0.91 = 317.1 \text{ l/min (ANR)}$.

NSU Series

How to order

NSU - **3** **S** **A** **10A** **NN** - **N** - **FP1**



Code	Content
A Body size	
3	Body width 63
4	Body width 79
B Membrane unit size	
S	Short
L	Long
C Needle valve *1	
A	Max. flow rate 20 L/min
B	Max. flow rate 80L/min
C	Max. flow rate 160L/min
D	Max. flow rate 240L/min
E	Max. flow rate 400L/min
D Port size	
10A	Rc3/8
10B	G3/8 *2
10C	NPT3/8 *3
E Inline oxygen monitor	
NN	No
AK	Yes
AM	Yes, with traceability cert, series variation diag, company cert.
F Option	
N	No option
X	Reverse flow
E	With exhaust port *5
H	Reverse flow + exhaust port
G Series	
Blank	Standard
FP1	Series for food processing

* Contact CKD for other combinations.

⚠ Precautions for model No. selection

*1: Refer to the table below for combinations of **C** Needle valve.

	Needle valve size NS-QDVL-***				
	20	80	160	240	400
NSU-3S	A	B			
NSU-3L	A	B	C		
NSU-4S	A	B	C	D	
NSU-4L	A	B	C	D	E

*2: When selecting G3/8, the regulator pressure gauge units will be shown as bar.
*3: When selecting NPT3/8, the regulator pressure gauge units will be shown as psi.

*4: Viewed from the front, standard products have an air inlet on the left port and a nitrogen gas outlet on the right port.

*5: Exhaust air (oxygen-enriched gas) from standard products is released into the atmosphere. Specify "E" to enable piping connection for exhaust air (oxygen-enriched gas). Size of exhaust port is Rc1/2.

* The above inline oxygen monitor does not include the connector cable.
Order the following connector cable discrete model No.

Connector cable discrete model No.

● DC cable

● AC adapter single unit

PNA- 1D

PNA-A

Cable length

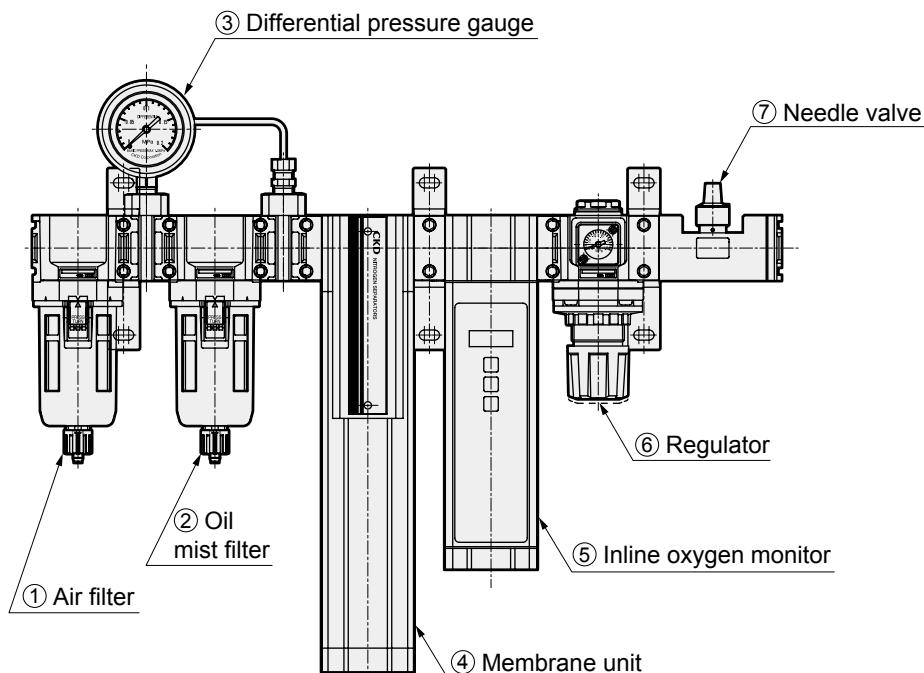
1D	1000 mm
3D	3000 mm
5D	5000 mm

Refer to page 8 for dimensions.

● AC adapter + conversion plug set

PNA-AG

Components



■ Standard (with port size Rc3/8)

Unit model No.	NSU-3S□	NSU-3L□	NSU-4S□	NSU-4L□
(1) Air filter	F3000-10-W-F		F4000-10-W-F	
(2) Oil mist filter	M3000-10-W-F1		M4000-10-W-F1	
(3) Differential pressure gauge		GA400-8-P02		
(4) Membrane unit	NS-3S110A- □	NS-3L110A- □	NS-4S110A- □	NS-4L110A- □
(5) Inline oxygen monitor		PNA-10A- □ -FP2		
(6) Regulator	NS-QR3-FP1		NS-QR4-FP1	
	NS-QDVL-020 NS-QDVL-080	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160 NS-QDVL-240	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160 NS-QDVL-240 NS-QDVL-400
(7) Needle valve				

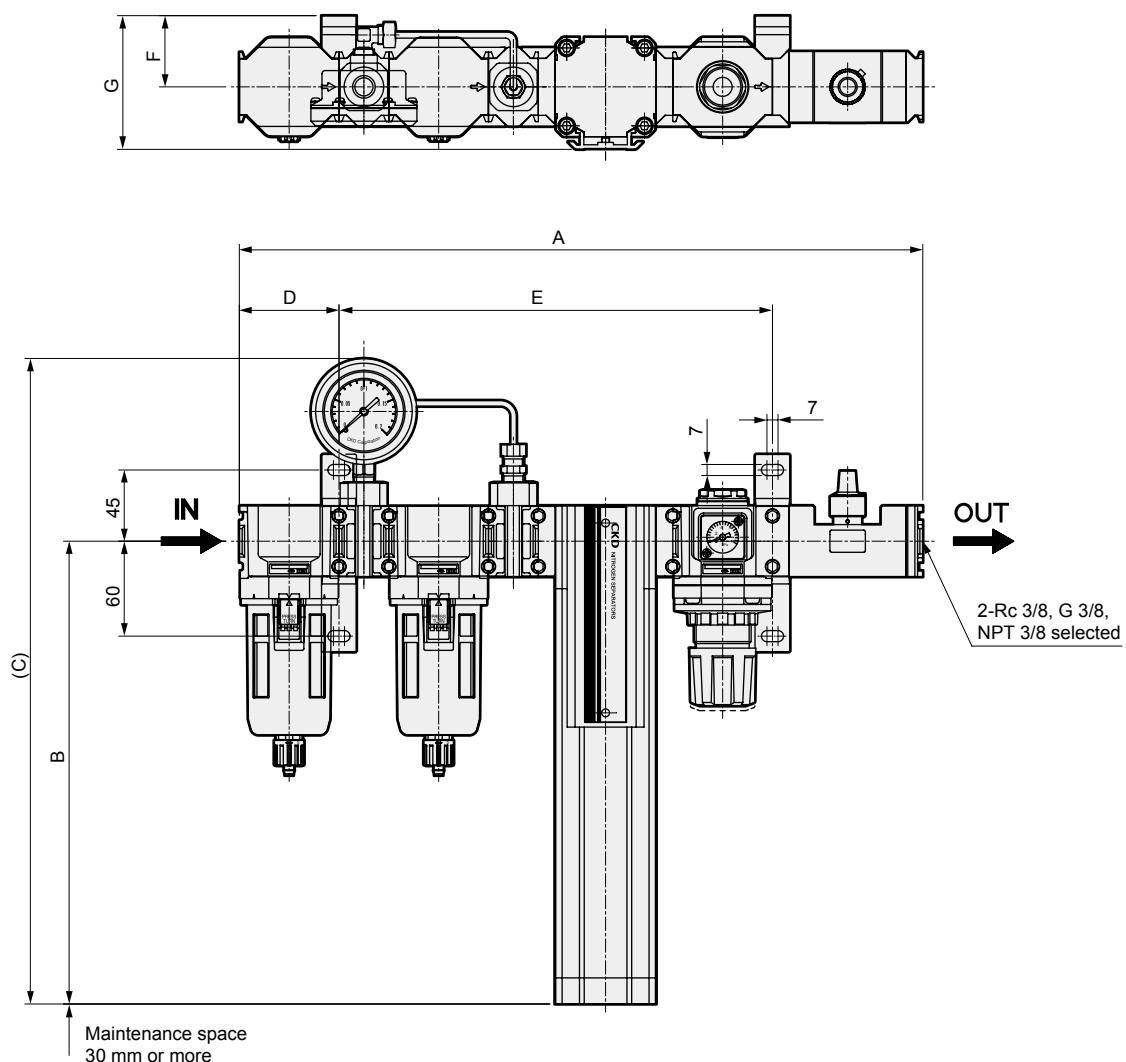
■ FP1 (with port size Rc3/8)

Unit model No.	NSU-3S□-FP1	NSU-3L□-FP1	NSU-4S□-FP1	NSU-4L□-FP1
(1) Air filter	F3000-10-W-F-FP1		F4000-10-W-F-FP1	
(2) Oil mist filter	M3000-10-W-F1-FP1		M4000-10-W-F1-FP1	
(3) Differential pressure gauge		GA400-8-P02		
(4) Membrane unit	NS-3S110A- □ -FP2	NS-3L110A- □ -FP2	NS-4S110A- □ -FP2	NS-4L110A- □ -FP2
(5) Inline oxygen monitor		PNA-10A- □ -FP2		
(6) Regulator	NS-QR3-FP1		NS-QR4-FP1	
	NS-QDVL-020 NS-QDVL-080	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160 NS-QDVL-240	NS-QDVL-020 NS-QDVL-080 NS-QDVL-160 NS-QDVL-240 NS-QDVL-400
(7) Needle valve				

*Contact CKD regarding port sizes G3/8 and NPT3/8.

Dimensions

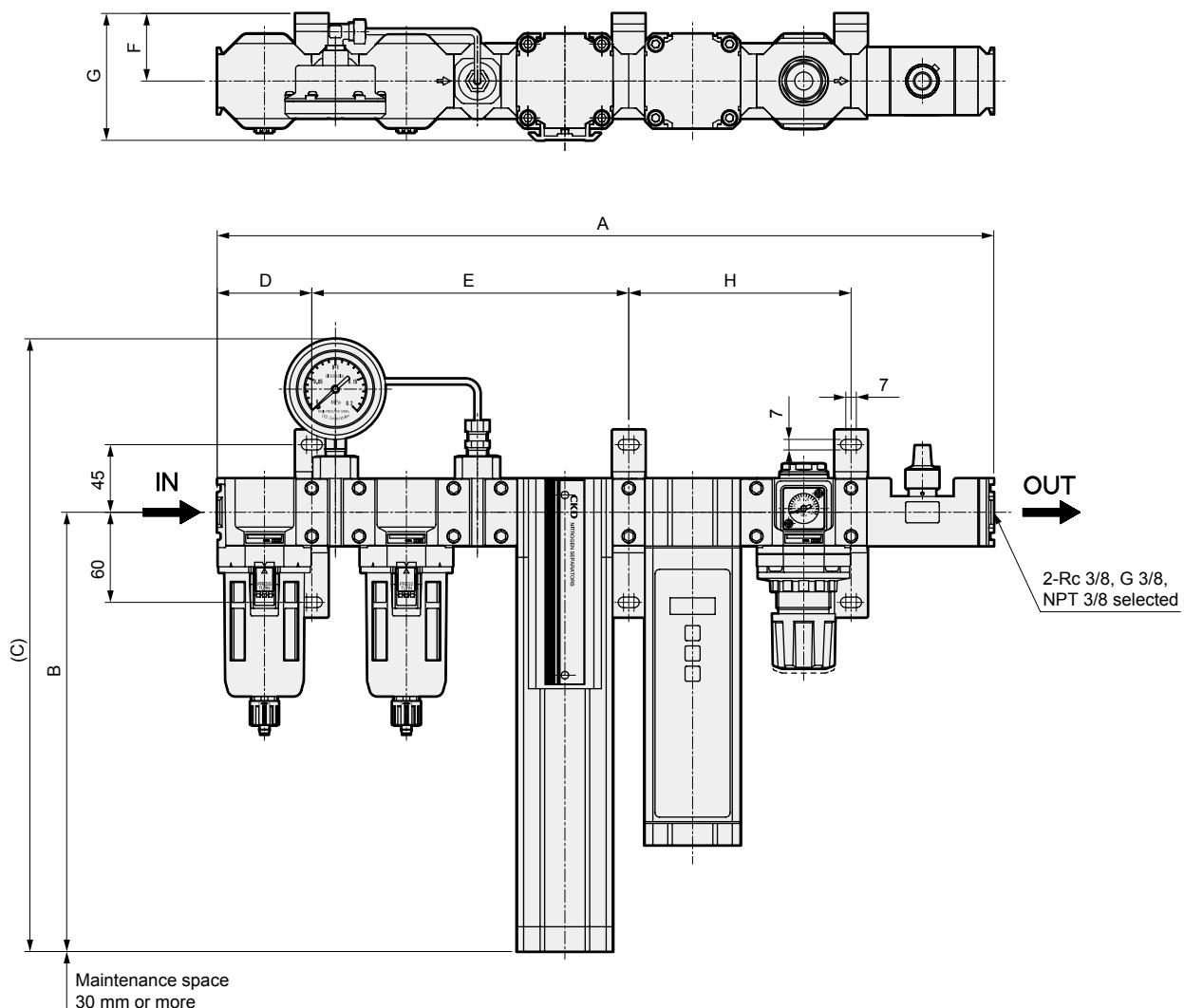
● Without inline oxygen monitor



Model No.	A	B	C	D	E	F	G	Weight (kg)
NSU-3S*10*NN	432	293	408	63	274	45	85	4.0
NSU-3L*10*NN	432	543	658	63	274	45	85	4.9
NSU-4S*10*NN	498	543	658	80	323	55	106	6.9
NSU-4L*10*NN	498	1043	1158	80	323	55	106	9.7

Dimensions

- With inline oxygen monitor



Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-3S*10**	517	293	408	63	211	45	85	148	5.6
NSU-3L*10**	517	543	658	63	211	45	85	148	6.5
NSU-4S*10**	583	543	658	80	243	55	106	165	8.5
NSU-4L*10**	583	1043	1158	80	243	55	106	165	11.3



Inline Oxygen Monitor

PNA Series

Inline pressure resistant structure with no purging required
Modular structure that can be connected to nitrogen refining
NS Series and F.R. units

**Specifications**

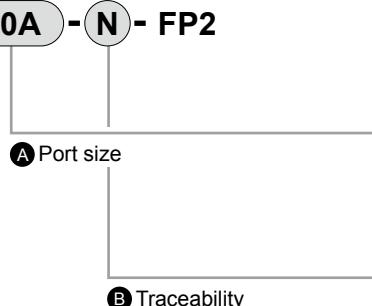
Descriptions		Content	
Measuring method		Zirconia solid electrolyte method	
Sampling method		Natural diffusion	
Display		Can be switched between oxygen concentration display and nitrogen concentration display (100 - oxygen concentration)	
Working fluid		Nitrogen-rich compressed air	
Working pressure	MPa	0 to 1.0	
Proof pressure	MPa	1.5	
Ambient temperature, humidity		0 to 50°C, 80% RH or less (no condensation)	
Fluid temperature		0 to 50°C (no condensation)	
Storage ambient temperature, humidity		-10 to 60°C, 80% RH or less (no condensation)	
Max. flow rate	L/min (ANR)	500 *1	
Measured range	% O ₂	0.00 to 25.00	
Accuracy	*2	For 0.00% to 1.00% O ₂ ±0.05% O ₂	
		For 1.01% to 2.50% O ₂ ±0.10% O ₂	
		For 2.51% to 10.00% O ₂ ±0.5% O ₂	
		For 10.01% to 25.00% O ₂ ±1.0% O ₂	
Response time		90% response within 20 seconds *3	
Analog output		4 to 20 mA current output (for 0.00 to 25.00% O ₂)	
Load resistance of analog output		0 to 400 Ω	
Analog output accuracy		0.064 mA/0.1% O ₂	
Switch output		Set value and detection element abnormality: 1 (relay output)	
Switch output capacity		24 VDC, 1 A	
Power supply voltage		24 VDC ±15% (when AC adapter is used: 100 to 240 VAC)	
Power consumption		10 W or less	
Degree of protection		IP65 or equivalent	
EMC Directive		EN61326-1	
Weight	kg	1.6	
Warmup time		About 5 minutes after turning on the power supply *4	

*1 For values exceeding 500 L/min (ANR), consult with CKD.

*2 Value in dry gas composed of oxygen and nitrogen.

*3 Response times are values under a flow rate of 5 L/min (ANR) or higher.

*4 Analog output and switch output are not output during warm up.

How to order main body**PNA- 10A - N - FP2**

* Connector cable is not included.
Refer to page 8 for details.

Code	Content
A Port size	
10A	Rc3/8
10B	G3/8
10C	NPT3/8
B Traceability	
N	No
M	Traceability cert. with series variation diagram and company cert.

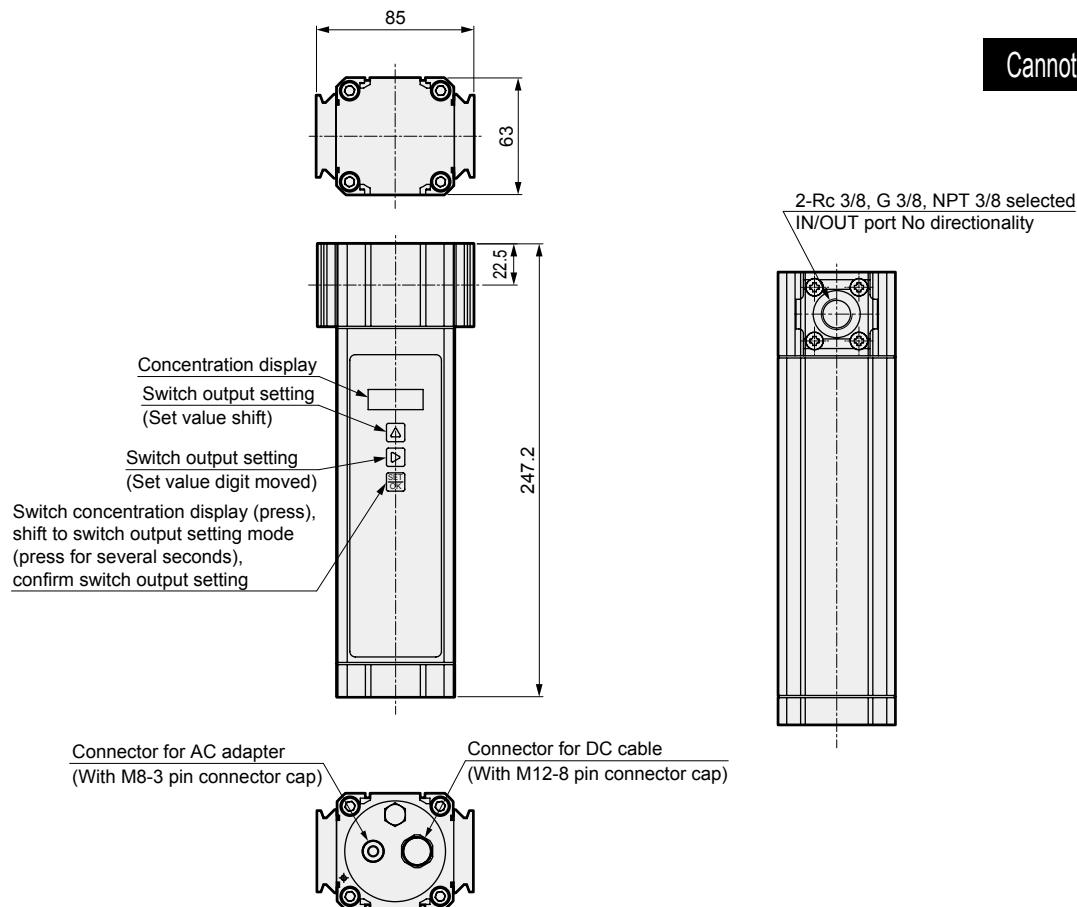
[Example of model No.]

PNA-10A-M-FP2

A Port size: Rc3/8

B Traceability: With traceability certificate, series variation diagram, and company certification

Dimensions



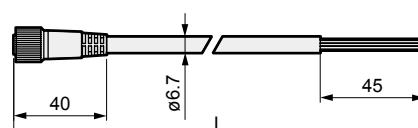
How to order connector cable and dimensions

*Connector cable is sold separately from the body.

● DC cable

Use when driving with a DC power supply and when using analog output or switch output.

Model No.	Dimension L	No.	Cable color	Content
PNA-1D	1000	1	White	Power supply +
PNA-3D	3000	2	Brown	Power supply -
PNA-5D	5000	3	Green	Analog output +
		4	Yellow	Analog output -
		5	Gray	Contact output (relay output)
		6	Pink	
		7	Blue	-
		8	-	-

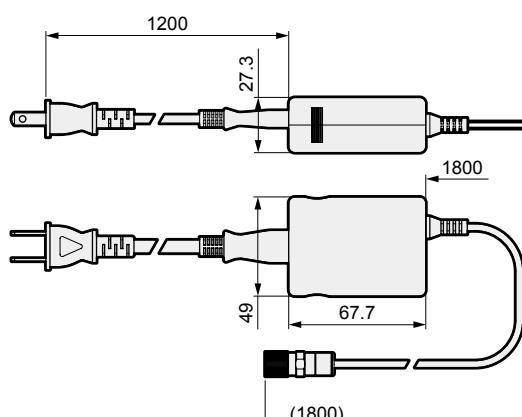
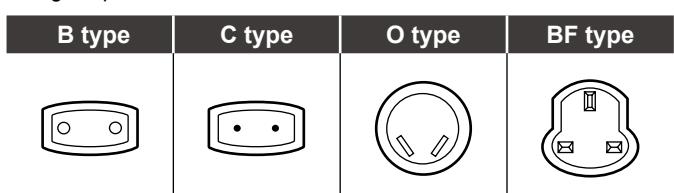


● AC adapter

Use when driving with an AC power supply.

Model No.	Content
PNA-A	AC adapter single unit A
PNA-AG	AC adapter + conversion plug set *Global power supply conversion plugs B, C, O and BF included.

• Plug shape



Nitrogen Gas Extraction Unit

NS Series

Modular design for easy system expansion with peripheral components

■ Nitrogen gas is obtained just by supplying compressed air.

**Specifications**

■ Single cylinder

Descriptions		NS-3S1	NS-3L1	NS-4S1	NS-4L1	
Range of working conditions	Working fluid	Compressed air				
	Inlet air pressure MPa	0.4 to 1.0				
	Proof pressure MPa	1.5				
	Inlet air temperature °C	5 to 50				
	Relative humidity of inlet air RH	50% or less				
	Ambient temperature °C	5 to 50				
Rating	Inlet air purity class	1:6:1 (according to JIS B 8392-1:2012)				
	Inlet air pressure MPa	0.7				
	Inlet air temperature °C	25				
	Ambient temperature °C	25				
Rated flow rate	Outlet nitrogen gas flow rate ℓ /min (ANR)	99.9	1.9	5.6	11.0	30.6
		99	5.0	15.5	28.2	66.9
		97	8.9	28.7	49.9	118.1
		95	14.0	39.8	65.3	169.2
	Inlet air flow rate ℓ /min (ANR)	99.9	21.2	62.3	122.3	340.0
		99	20.9	64.6	117.5	278.8
		97	24.1	77.6	134.9	319.2
		95	31.2	88.5	145.2	376.0

■ Multiple cylinders

Descriptions		NS-4S2	NS-4S3	NS-4L2	NS-4L3	NS-4S6	NS-4S8	NS-4SA	NS-4L6	NS-4L8	
Range of working conditions	Working fluid	Compressed air									
	Inlet air pressure MPa	0.4 to 1.0									
	Proof pressure MPa	1.5									
	Inlet air temperature °C	5 to 50									
	Relative humidity of inlet air RH	50% or less									
	Ambient temperature °C	5 to 50									
Rating	Inlet air purity class	1:6:1 (according to JIS B 8392-1:2012)									
	Inlet air pressure MPa	0.7									
	Inlet air temperature °C	25									
	Ambient temperature °C	25									
Rated flow rate	Outlet nitrogen gas flow rate ℓ /min (ANR)	99.9	22.0	33.0	61.2	91.8	66.0	88.0	110.0	183.6	244.8
		99	56.4	84.6	133.8	200.7	169.2	225.6	282.0	401.4	535.2
		97	99.8	149.7	236.2	354.3	299.4	399.2	499.0	708.6	944.8
		95	130.6	195.9	338.4	507.6	391.8	522.4	653.0	1015.2	1353.6
	Inlet air flow rate ℓ /min (ANR)	99.9	244.6	366.9	680.0	1020.0	733.8	978.4	1223.0	2040.0	2720.0
		99	235.0	352.5	557.6	836.4	705.0	940.0	1175.0	1672.8	2230.4
		97	269.8	404.7	638.4	957.6	809.4	1079.2	1349.0	1915.2	2553.6
		95	290.4	435.6	752.0	1128.0	871.2	1161.6	1452.0	2256.0	3008.0

Note: The product will be floor-mounted for 6 units or more.

Selection guide

As temperature and inlet air pressure affect outlet nitrogen gas flow rate, correction is required if they differ from the rated values listed in the specifications.

STEP 1 Confirm the working conditions and the rated values listed in the specifications.

Working conditions: Inlet air pressure, inlet air temperature, required nitrogen gas flow rate

STEP 2 Confirm the compensation coefficient for outlet nitrogen gas flow rate affected by inlet air temperature.

(1) Temperature - Gas flow rate compensation coefficient

Temperature (°C)	Outlet nitrogen gas concentration			
	99.9%	99%	97%	95%
5	0.64	0.79	0.79	0.75
10	0.73	0.84	0.84	0.81
25	1	1	1	1
40	0.95	1.08	1.06	1.11
50	0.9	1.09	1.11	1.15

STEP 3 Confirm the compensation coefficient for outlet nitrogen gas flow rate affected by inlet air pressure.

(2) Pressure - Gas flow rate compensation coefficient

Pressure (MPa)						
0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.4	0.65	0.75	1	1.07	1.2	1.3

STEP 4 Find the appropriate model based on the rated outlet nitrogen gas flow rate of each model.

Rated outlet nitrogen gas flow rate x (1) temperature gas flow rate compensation coefficient x (2) pressure gas flow rate compensation coefficient = compensated outlet nitrogen gas flow rate
Select one with sufficient outlet nitrogen gas flow rate after compensation with the above formula.

STEP 5 Confirm the compensation coefficient for inlet air flow rate affected by inlet air temperature.

(3) Temperature - Air flow rate compensation coefficient

Temperature (°C)	Outlet nitrogen gas concentration			
	99.9%	99%	97%	95%
5	0.73	0.68	0.75	0.69
10	0.8	0.76	0.81	0.77
25	1	1	1	1
40	1.32	1.25	1.17	1.2
50	2.05	1.38	1.31	1.31

STEP 6 Confirm the compensation coefficient for inlet air flow rate affected by inlet air pressure.

(4) Pressure - Air flow rate compensation coefficient

Pressure (MPa)						
0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.61	0.79	0.91	1	1.07	1.2	1.3

STEP 7 Find the inlet air flow rate from the rated outlet nitrogen gas flow rate of each model.

Inlet air flow rate of the model selected in STEP 4 x (3) temperature air flow rate compensation coefficient x (4) pressure air flow rate compensation coefficient = compensated inlet air flow rate l/min (ANR)
Based on the inlet air flow rate compensated as above, confirm whether the compressor capacity is sufficient.

Example of calculation

Conditions	Working conditions	Selecting conditions	Compensation coefficient for outlet nitrogen gas flow rate	Compensation coefficient for inlet air flow rate
Inlet air temperature	35 to 39°C	40°C	(1) 1.08	(3) 1.25
Inlet air pressure	0.5 to 0.55 MPa	0.5 MPa	(2) 0.65	(4) 0.79

Substitute the above conditions into the equation above to obtain the outlet nitrogen gas flow rate when using NS-4L1 at a nitrogen concentration of 99%. It will be: 66.9 (rated outlet nitrogen gas flow rate) x 1.08 x 0.65 = 46.9 l/min (ANR).

If the required nitrogen gas flow rate is less than or equal to this value, select that model.

In this case, the inlet air flow rate is calculated as: 278.8 x 1.25 x 0.79 = 275.3 l/min (ANR).

NS Series

How to order

NS -	3	S	1	10A	-	B	-	FP2
Model No.	(A) Body size							
	(B) Membrane unit size							
	(C) No. of units							
	(D) Port size							
	(E) Option							
	(F) Series							

A Body size

Code	Content
A Body size	
3	Body width 63
4	Body width 79

B Membrane unit size

Code	Content
S	Short
L	Long

C No. of units *1

Code	Content
1	1 pc.
2	2 (available with NS-4S, 4L)
3	3 (available with NS-4S, 4L)
6	6 (available with NS-4S, 4L)
8	8 (available with NS-4S, 4L)
A	10 (available with NS-4S)

D Port size

Code	Content
10A	Rc 3/8 (NS-3S1, 3L1, 4S1, 4L1)
10B	G 3/8 (NS-3S1, 3L1, 4S1, 4L1)
10C	NPT 3/8 (NS-3S1, 3L1, 4S1, 4L1)
20A	Rc 3/4 (NS-4S2, 4S3, 4L2, 4L3)
20B	G 3/4 (NS-4S2, 4S3, 4L2, 4L3)
20C	NPT 3/4 (NS-4S2, 4S3, 4L2, 4L3)
25A	Rc 1 (NS-4S6, 4S8, 4SA, 4L6, 4L8)
25B	G 1 (NS-4S6, 4S8, 4SA, 4L6, 4L8)
25C	NPT 1 (NS-4S6, 4S8, 4SA, 4L6, 4L8)

E Option *2

Code	Content
N	No option
B	Bracket
C	Bracket + reverse flow
D	Bracket + exhaust port
F	Bracket + reverse flow + exhaust port
X	Reverse flow
E	Exhaust port
H	Reverse flow + exhaust port

F Series

Code	Content
Blank	Standard
FP2	Series for food processing

⚠ Precautions for model No. selection

*1: The product will be floor-mounted without bracket for 6 units or more.

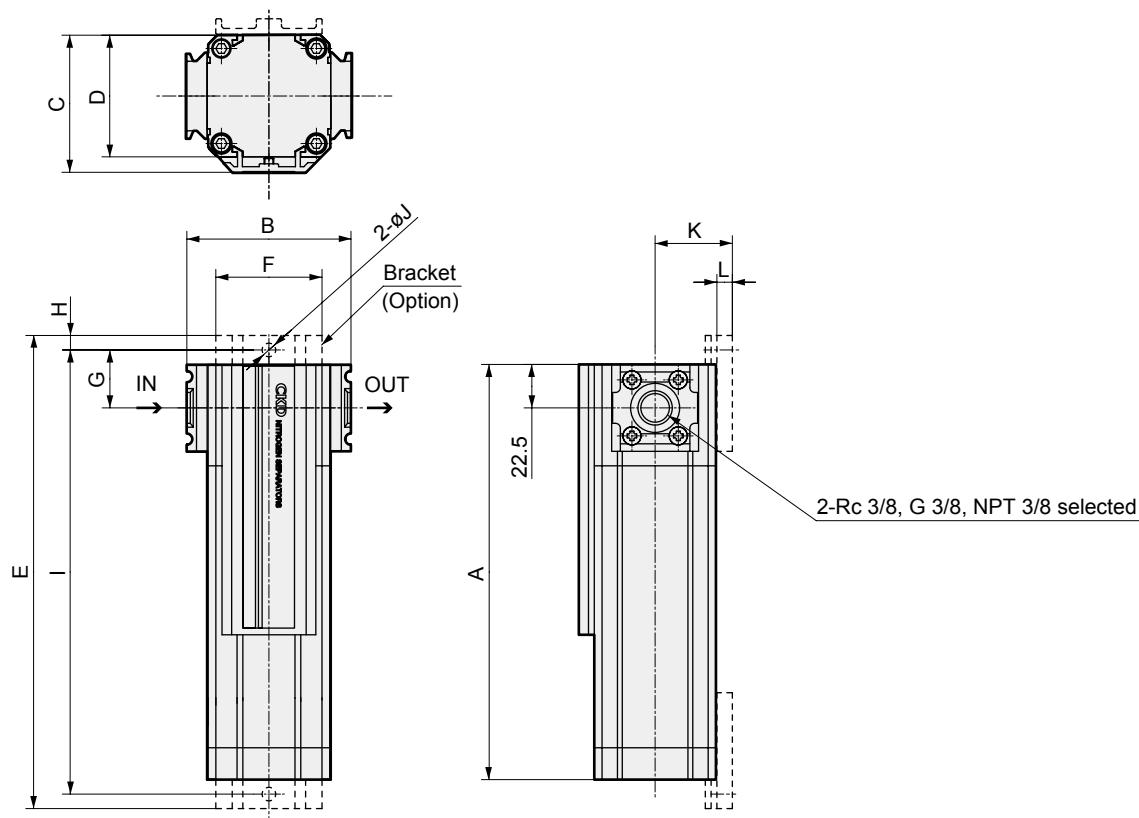
*2: Viewed from the front, a standard product has an air inlet on the left port, while an air outlet on the right port. For "X", an air inlet is provided on the right port, with an air outlet provided on the left port.

*3: Exhaust air (oxygen-enriched gas) from standard products is released into the atmosphere.

Specify "E" to enable piping connection for exhaust air (oxygen-enriched gas).

Size of exhaust port is Rc1/2.

Dimensions

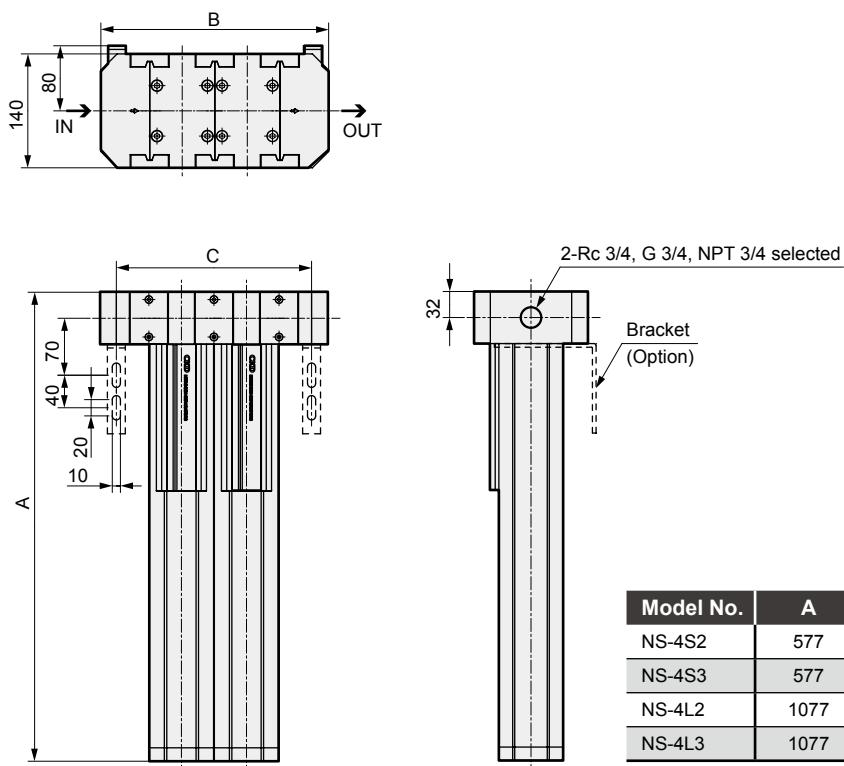


Model No.	A	B	C	D	Weight (kg)	Relative bracket dimensions							
						E	F	G	H	I	J	K	L
NS-3S1	315	85	71	63	1.8	345	55	30	7.5	330	7	40	8
NS-3L1	565	85	71	63	2.7	595	55	30	7.5	580	7	40	8
NS-4S1	565	100	90	79	4.0	605	70	32.5	10	585	9	50	10
NS-4L1	1065	100	90	79	6.8	1105	70	32.5	10	1085	9	50	10

NS Series

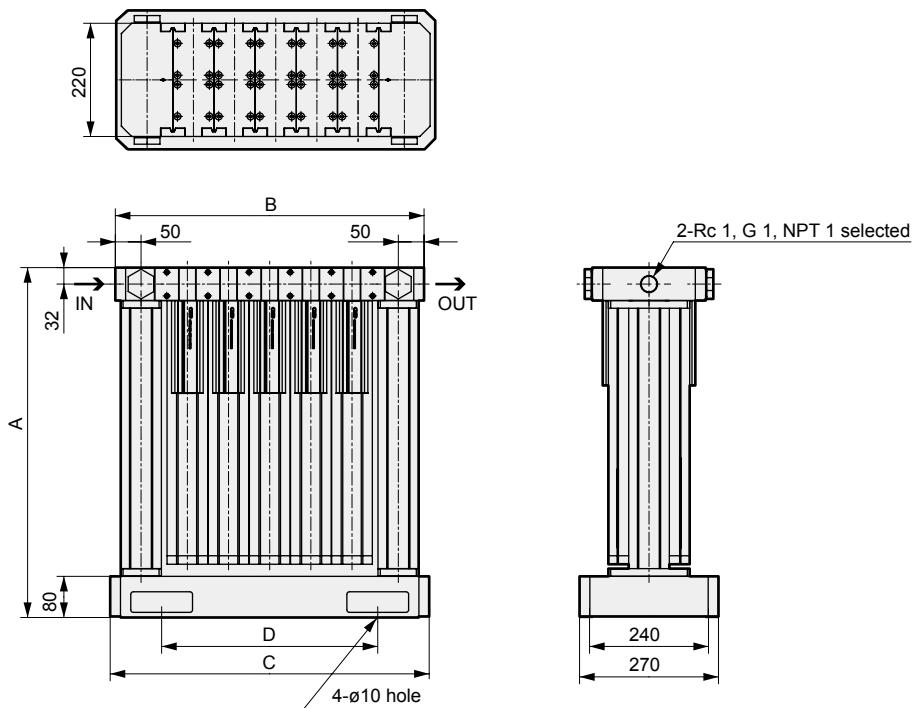
Dimensions

● 2 or 3 units



Model No.	A	B	C	Weight (kg)
NS-4S2	577	280	240	12
NS-4S3	577	360	320	17
NS-4L2	1077	280	240	18
NS-4L3	1077	360	320	25

● 6, 8 or 10 units



Model No.	A	B	C	D	Weight (kg)
NS-4S6	680	440	460	260	41
NS-4S8	680	520	540	340	50
NS-4SA	680	600	620	420	59
NS-4L6	1180	440	460	260	63
NS-4L8	1180	520	540	340	78



Safety Precautions

Be sure to read this section before use.

When designing and manufacturing equipment using CKD products, the manufacturer is obligated to ensure that the safety of the mechanism, pneumatic control circuit and/or water control circuit and the system that runs the electrical controls are secured.

It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.

Observe warnings and precautions to ensure device safety.

Check that device safety is ensured, and manufacture a safe device.

⚠ WARNING

- 1 This product is designed and manufactured as a general industrial machine part.
It must be handled by an operator having sufficient knowledge and experience.

- 2 Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product. This product is intended for use as a device or part for general-purpose industrial machinery. It is not intended for use outdoors (except for outdoor types) or for use under the following conditions or environments.

(Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

- ① Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
- ② Use for applications where life or assets could be significantly affected, and special safety measures are required.

- 3 Observe organization standards and regulations, etc., related to the safety of the device design and control, etc.

ISO4414, JIS B 8370 (General rules for pneumatic systems)

JFPS2008 (Principles for pneumatic cylinder selection and use)

High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

- 4 Do not handle, pipe, or remove devices before confirming safety.

- ① Inspect and service the machine and devices after confirming safety of all systems related to this product.

- ② Note that there may be hot or charged sections even after operation is stopped.

- ③ When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility. Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.

- ④ When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.

- 5 Observe the warnings and cautions on the following pages to prevent accidents.

- Precautions are ranked as "DANGER", "WARNING", and "CAUTION" in this section.

⚠ DANGER: In the case where the product operation is mishandled and/or when the urgency of a dangerous situation is high, it may lead to fatalities or serious injuries.

⚠ WARNING: A dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.

⚠ CAUTION: A dangerous situation may occur if handling is mistaken, leading to minor injuries or property damage.

Note that some items indicated with "CAUTION" may lead to serious results depending on the conditions.
All items contain important information and must be observed.

Limited warranty and disclaimer

- 1 Warranty period

This warranty is valid for one (1) year after delivery to the customer's designated site.

- 2 Scope of warranty

In case any defect clearly attributable to CKD is found during the warranty period, CKD shall, at its own discretion, repair the defect or replace the relevant product in whole or in part and at no cost, according to its own judgment. Note that the following failures are excluded from the warranty scope:

- (1) Failures due to use outside the conditions and environments set forth in the catalog or these specifications.
- (2) Failures resulting from factors other than this product.
- (3) Failures caused by improper use of the product.
- (4) Failures resulting from modifications or repairs made without CKD consent.
- (5) Failures caused by matters that could not be predicted with the technologies in practice when the product was delivered.
- (6) Failures resulting from natural disasters or accidents for which CKD is not liable.

The warranty covers the actual delivered product, as a single unit, and does not cover any damages resulting from losses induced by malfunctions in the delivered product.

- 3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.



Pneumatic components (nitrogen gas extraction unit)

Safety Precautions

Be sure to read this section before use.

Refer to "Pneumatic, Vacuum and Auxiliary Components (No. CB-024SA)" for general precautions. Although the above general catalog states that products are not applicable for equipment or applications with direct contact with beverages/foodstuffs, the FP2 Series products can be used in such applications as long as they are within the range of the product specifications.

Product-specific cautions: Nitrogen gas extraction unit NS, NSU, PNA Series

Design/selection

⚠ CAUTION

■ Working environment

- Avoid installing this product where it will be subject to direct sunlight or rain.
- As the bowl material is polycarbonate, avoid use with the following chemicals or in an atmosphere containing these chemicals. [NSU Series]
- Avoid use in environments where ozone is generated.
- Avoid using this product where vibration and impact are present.
- Avoid use in environments with moist air with a relative humidity of 50% or higher.(Performance will decrease sharply if the separation membrane gets wet with droplets (such as water).)
- Avoid air flow containing corrosive gas (strongly acidic gases such as hydrogen sulfide, sulfur dioxide, hydrogen chloride or fluorine) or strongly alkaline gas (amines, ammonia, caustic soda, etc.).

■ The needle valve cannot be used as a stop valve that requires no leakage.

Slight leakage is allowed for in this product's specifications.

■ Dust cannot be completely kept out of the flow path.

Install a final clean filter if dust could be a problem with the circuit. (Use antibacterial/sterilization filters for food processes.)

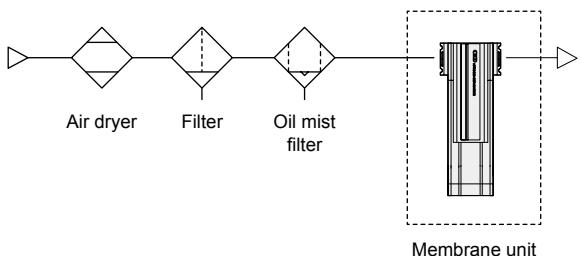
■ "Compatible with Food Sanitation Act" indicates that the product material conforms to the Food Sanitation Act.

■ Decide on product use after carefully confirming the conformity of the working atmosphere, working fluids, valve structure and component material of each device.

■ Internal components may become worn due to the operation of the needle valve. If affected, take necessary measures such as installing a filter on the secondary side.

■ Check the working circuit and working fluid.

To prevent drop in membrane unit performance, install the dryer, air filter and oil mist filter on the primary side, and remove water or oil. When the working fluid may contain hydrocarbons, install an activated carbon filter.



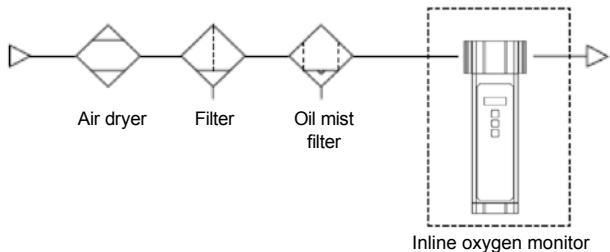
Precautions for the inline oxygen monitor

■ Working environment

- Avoid installing this product where it will be subject to direct sunlight or rain.
- In the following atmospheres, the inline oxygen monitor may generate measurement errors, or the performance of the components or oxygen detection element may suffer.
 - Avoid use in temperatures below 0°C or above 50°C, or when the constituents differ from those of air, as larger measurement errors will result.
 - The device cannot be used in air containing freon gas, silicon gases, corrosive gases such as SOx (sulfur oxides) or H₂S (hydrogen sulfide), or halogen gases such as Cl₂(chlorine), F₂ (fluorine), or Br₂ (bromine), or in air where these gases separate at high temperatures of approximately 500°C.
 - If used in air containing flammable gases, the flammable gas will burn and the results will decrease.
 - Use in air containing large quantities of dust or oil mist will lead to element deterioration.
 - The element will be damaged if the sensor is exposed to liquids such as water drops or liquid solutions.
 - The element will be damaged if used in locations with strong impacts or vibrations.
 - Avoid use in locations with strong magnetic fields or significant electrical noise.
 - The results will fail to stabilize in environments where the pressure pulses (changes continuously) in a short cycle. Static pressure is required for stable measurement.

■ Check the working circuit and working fluid.

To prevent decreased inline oxygen monitor performance, install the dryer, air filter and oil mist filter on the primary side, and remove water or oil.



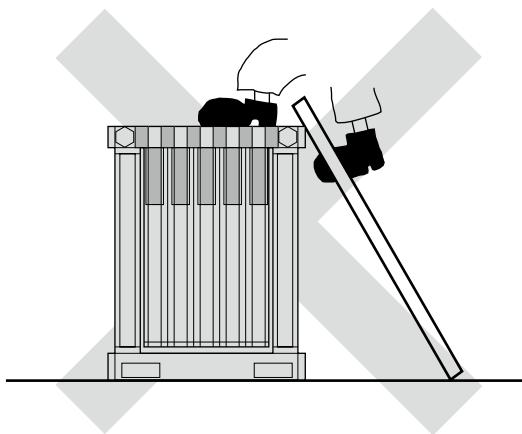
- This product does not have explosion-proof specifications. The detection element is heated by a heater, so use in an explosive atmosphere could induce explosions.
- This product is not an oxygen detector. Do not use it as an oxygen concentration monitor in accordance with the Industrial Safety and Health Act.
- When using this product as a CE compliant product, prepare a dedicated power supply.
- Working conditions for CE compliant products
This product is CE-marked, indicating conformity with the EMC Directives. The standard for the immunity for industrial environments applied to this product is EN61326-1. The following stability is applicable in an EMC Directive demand test environment.
 - Stability ±0.5% O₂ ±1 digit (for 0.00 to 10.00% O₂)
 - ±1.0% O₂ ±1 digit (for 10.01 to 25.00% O₂)

Types of chemicals	Categories of chemicals	Main products of chemicals	General applications	Polycarbonate
Inorganic compounds	Acids	Hydrochloric acid, sulfuric acid, fluorine, phosphoric acid, chromic acid, etc.	Acid washing of metals, acidic degreasing solutions, coating treatment solution	×
	Alkalines	Caustic soda, caustic potash, calcium hydroxide, aqueous ammonia, sodium carbonate, etc.	Alkaline degreasing solution for metals	×
	Inorganic salts	Sodium sulfide, potassium nitrate, potassium bichromate, sodium sulfate, etc.		×
Organic compounds	Aromatic hydrocarbons	Benzene, toluene, xylene, ethyl benzene, styrene, etc.	Contained in paint thinner (Benzene, toluene, and xylene)	×
	Chlorinated aliphatic hydrocarbons	Methyl chloride, ethylene chloride, methylene chloride, acetylene chloride, chloroform, trichlene, perchlene, carbon tetrachloride	Organic solvent-based washing solution for metals (trichlene, perchlene, carbon tetrachloride, etc.)	×
	Chlorinated aromatic hydrocarbons	Chlorobenzene, dichlorobenzene, benzene hexachloride (B/H/C), etc.	Agricultural chemicals	×
	Petroleum components	Solvent, naphtha, gasoline		×
	Alcohols	Methyl alcohol, ethyl alcohol, cyclohexanol, benzyl alcohol	Used as antifreezing agent	×
	Phenol	Carbolic acid, cresol, naphthol, etc.	Disinfectant solution	×
	Ethers	Methyl ether, methyl ethyl ether, ethyl ether	Additive of brake oil	×
	Ketones	Acetone, methyl ethyl ketone, cyclohexanone, acetophenone, etc.		×
	Carboxylic acids	Formic acid, acetic acid, butyl acid, acrylic acid, oxalic acid, phthalic acid, etc.	Dyes/oxalic acid are used for aluminum treatment Phthalic acid is used as a paint base	×
	Phosphate esters	Dimethyl phthalate (DMP), diethyl phthalate (DEP), dibutyl phthalate (DBP), dioctyl phthalate (DOP)	Lubricant, synthetic coolant, rust preventing agent additives Used as plasticizer for synthetic resin	×
	Oxyacids	Glycol acid, lactic acid, malic acid, citric acid, tartaric acid		×
	Nitro compounds	Nitromethane, nitroethane, nitroethylene, nitrobenzene, etc.		×
	Amines	Methylamine, dimethylamine, ethylamine, aniline, acetanilide, etc.	Additive of brake oil	×
	Nitriles	Acetonitrile, acrylonitrile, benzonitrile, acetoisonitrile, etc.	Raw material for nitrile rubber	×

Mounting, installation and adjustment

⚠ CAUTION

- Do not step onto the body.



- When piping, remove cutting oil, rust preventing agents, contaminants, etc.
- Mount air filters or oil mist filters so that the drain outlet faces straight downward. Use a bore size Ø5.7 to 6 tube for drain discharge piping, and keep the length within 5 m. Avoid vertical piping. [NSU Series]
- Be sure to install an oil removing filter (M type) immediately before the membrane unit to remove water drops and oil.
If oil adheres to the separation membrane, nitrogen concentration may decrease.
- Install the regulator on the outlet side of the membrane unit.
- When installing NS (2/3 units), fix the inlet and outlet pipes or fix the body with a bracket.
- When installing NS (6 units or more), place it on a solid and flat surface that does not vibrate and fix the base with anchor bolts.

Precautions for needle valves with adjusting dial

- To adjust the flow rate, turn the dial to the right to open or the left to close.
- After adjustment, lock the dial with the sliding lock lever.
- The flow rate control range is from "1" to "12" or "13" on the dial rotation display.
Do not set the flow rate outside this range. Turning the dial to the fully closed or fully open position forcibly may result in failure or abnormal flow characteristics.
- Even when the needle is fully closed, the dial display is not 0.
Calibration of the dial indicator flow rate is performed when the needle is not fully closed. Note that 0 is not necessarily indicated when the needle is fully closed. After "0", either "19" or no number at all is displayed.
- Do not remove the dial from the body.
If the dial is removed, readjustment and calibration of flow characteristics cannot be performed.

Use/maintenance

⚠ WARNING

■ As nitrogen gas involves the risk of oxygen deficiency, use the product according to the following instructions.

- Use in well ventilated locations.
- Ventilate the work area when nitrogen gas is being used.
- Periodically inspect nitrogen gas piping for leakage.

■ As oxygen-enriched gas is released from the exhaust unit of the membrane unit, note the following when installing the product.

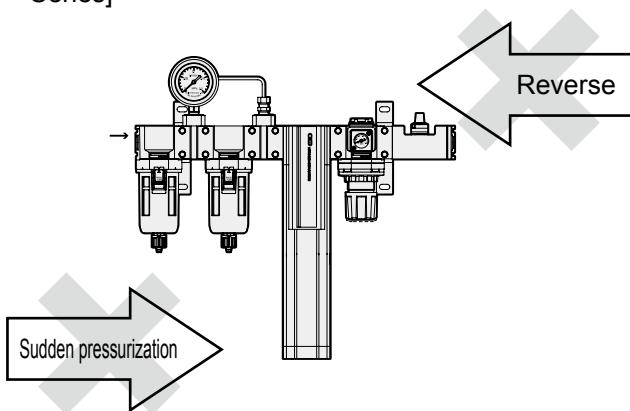
- Install away from fire or flammable objects.
- Ventilate the work area during operation of the equipment.

■ Do not use the product for any purpose directly related to human life.

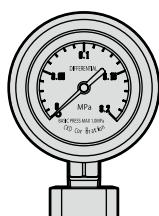
⚠ CAUTION

■ Do not use reverse airflow.

Do not pressurize suddenly. The differential pressure gauge or mantle may be damaged. [NSU Series]



■ The oil mist filter life is spent when the pressure drops to 0.07 MPa or after one year of use, whichever comes first. Replace the mantle with a new one at the end of its life (check the pressure drop with a differential pressure gauge).
(Do not touch the urethane rubber foam layer when replacing the mantle)
[NSU Series]



0.07 MPa

■ The service life of the membrane unit differs according to the working conditions. As a guideline, replace the membrane every 3 to 5 years.

■ Confirm that pressure has been released before mounting or removing the bowl and bowl guard. [NSU Series]

■ Be aware that adequate time is necessary to obtain the required nitrogen concentration after compressed air is supplied.

Precautions for the inline oxygen monitor

■ Do not disassemble or modify this product. Doing so could result in faults.

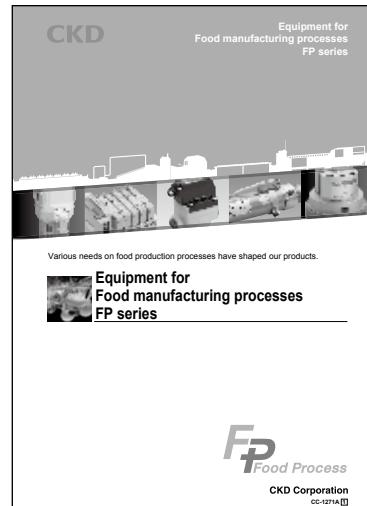
■ The sensor may deteriorate depending on the working conditions. To maintain performance longer, yearly calibration is recommended.

Related products

Equipment for food manufacturing processes FP Series

- A broad lineup ranging from air filters to actuators that can be used safely and securely in food manufacturing processes.
- The FP1 Series uses food-grade (NSF H1) lubricant to eliminate concerns over lubricant-based contamination.
- The FP2 Series uses resin/rubber materials compatible with the Food Sanitation Act in addition to FP1.

Catalog No. CC-1271A



Anti-bacterial/bacteria-removing filter

- Anti-bacterial activation value 4 or more
- Bacterial retention performance: LRV8 or higher
- Resin materials/rubber materials used in the fluid passage section are compatible with the Food Sanitation Act.
- Uses food-grade NSF H1 grease.
- Exterior parts use antimicrobial materials.
- Maintenance seal is provided as standard for easy maintenance period management.
- New odor removal filter added to lineup

Catalog No. CC-1311A



Air blow nozzle BN* Series

- A wide range of variations
Diverse lineup to match applications or industries.
- Energy saving
A special structure which brings in the surrounding air to enhance the pneumatic air source. Strong air jets even with minimal air consumption.
- Uniformity
A special structure which ejects air more uniformly at the desired area. The key to stable workpiece quality.
- Low noise
A low-noise, work-environment-friendly design suppressing turbulence. Flat and round types are available in accordance with applications.

Catalog No. CC-1347A



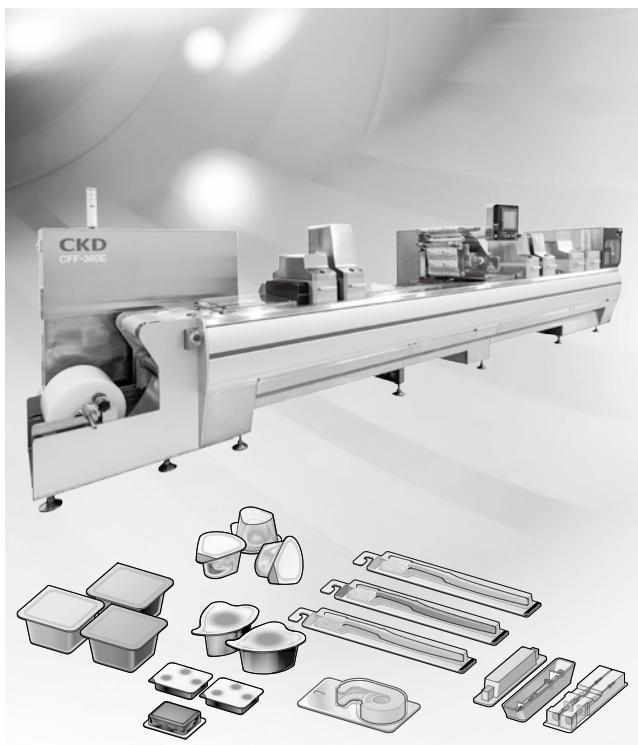
Super dryer SD/SU Series

- Freon-free dryer which does not cause environmental damage.
- No movable parts, so clean dry air can be supplied for long periods of time.
- Lighter, more compact, and easily built into installations.
- As it uses no electricity whatsoever, there is no noise or effects thereof.
- Ultra low dew point of max -60°C.
- Compatible with 75 kW grade large flow rate compressors.

Catalog No. CB-024SA



Introduction of ECO Blister CFF-360E

*Easy*

Mold thickness control
(plug movement) is
easily set digitally

*Easy*

Sealing pressure control
is easily set digitally



For operation cost reduction

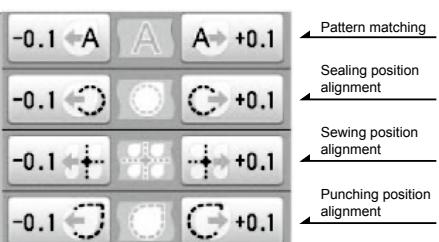
For labor reduction

For contamination countermeasures

*Easy*

Consistently precise punching and
sealing positions thanks to
automatic positioning calibration

| Easy operation is a breeze



Position alignment can be easily set with "+" and "-"