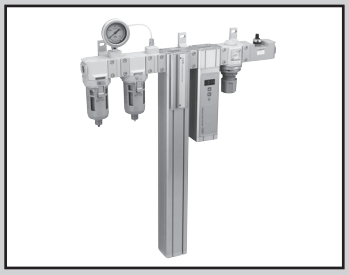


Nitrogen Gas Extraction Unit, system

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

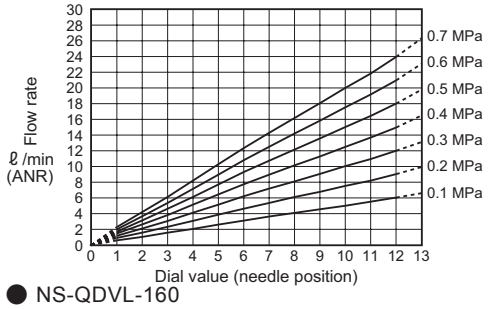
Descriptions				NSU-3S	NSU-3L	NSU-4S	NSU-4L
Range of working conditions	Working fluid			Compressed air			
	Inlet air pressure		MPa	0.4 to 1.0			
	Proof pressure		MPa	1.5			
	Inlet air temperature		°C	5 to 50			
	Relative humidity of inlet air		RH	50%			
	Ambient temperature		°C	5 to 50			
Rating	Inlet 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)	Nitrogen concentration (%)	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
Air filter		Filtration	μm	5			
Oil mist filter		Oil removal	mg/m³	0.01 or less (0.1 or less after oil saturation) * The measured value when primary oil concentration is 30 mg/m³ 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.

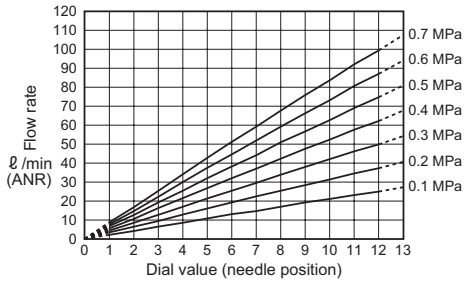
Needle valve flow characteristics

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

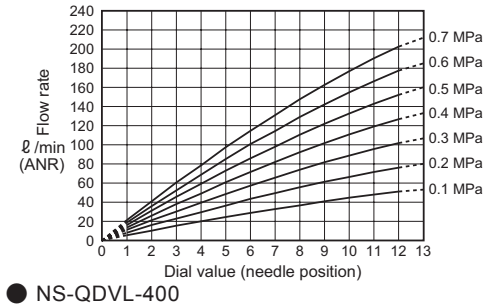
● NS-QDVL-020



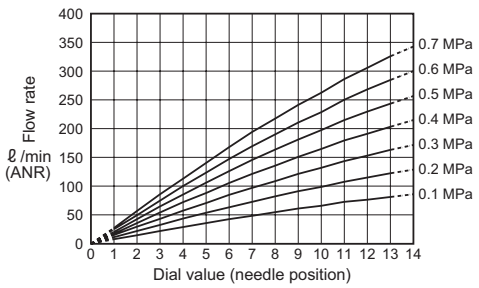
● NS-QDVL-080



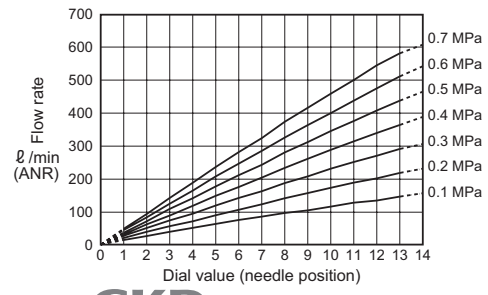
● NS-QDVL-160



● NS-QDVL-240



● NS-QDVL-400



CKD

Selection guide

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 (outlet nitrogen gas flow rate) ÷ 1.08 ÷ 0.75 = 61.7 [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 x 1.25 x 0.91 = 317.1 ℓ/min (ANR).

How to order

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

Ⓐ Body size
Ⓑ Membrane unit size
Ⓒ Needle valve
Ⓓ Port size
Ⓔ Inline oxygen monitor
Ⓕ Option
Ⓖ Series

Code	Content	
Ⓐ Body size		
3	Body width 63	
4	Body width 79	
Ⓑ Membrane unit size		
S	Short	
L	Long	
Ⓒ 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	
Ⓓ Port size		
10A	Rc3/8	*2
10B	G3/8	*3
10C	NPT3/8	
Ⓔ Inline oxygen monitor		
NN	No	
AK	Yes	
AM	Yes, with traceability cert, series variation diag, company cert.	
Ⓕ Option		
N	No option	
X	Reverse flow	
E	With exhaust port	*5
H	Reverse flow + exhaust port	
Ⓖ 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 Ⓒ 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

PNA- 1D

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

Refer to page 8 for dimensions.

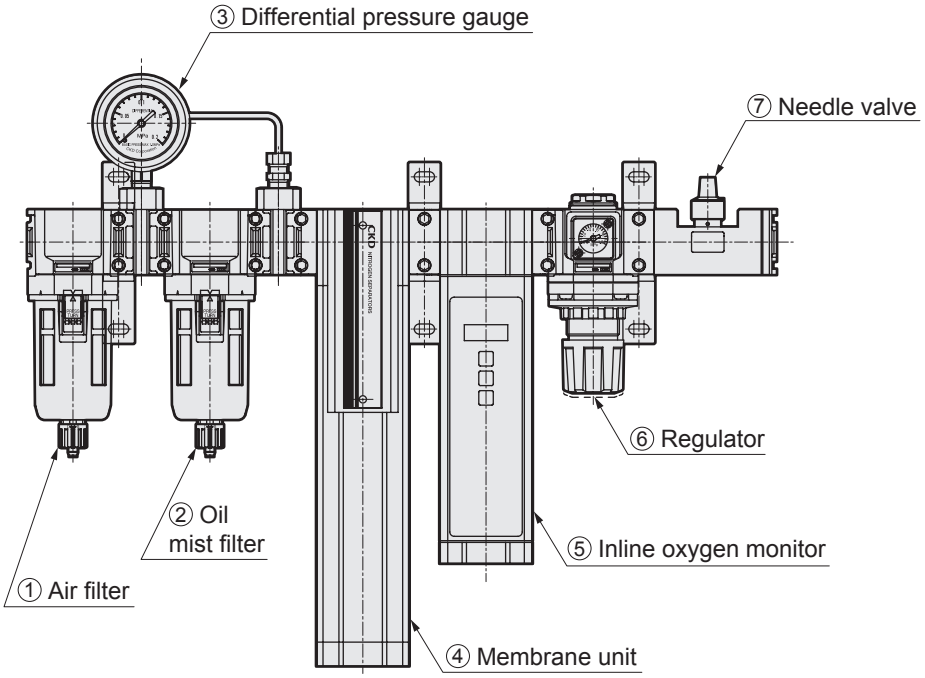
● AC adapter single unit

PNA-A

● 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	
(7) Needle valve	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

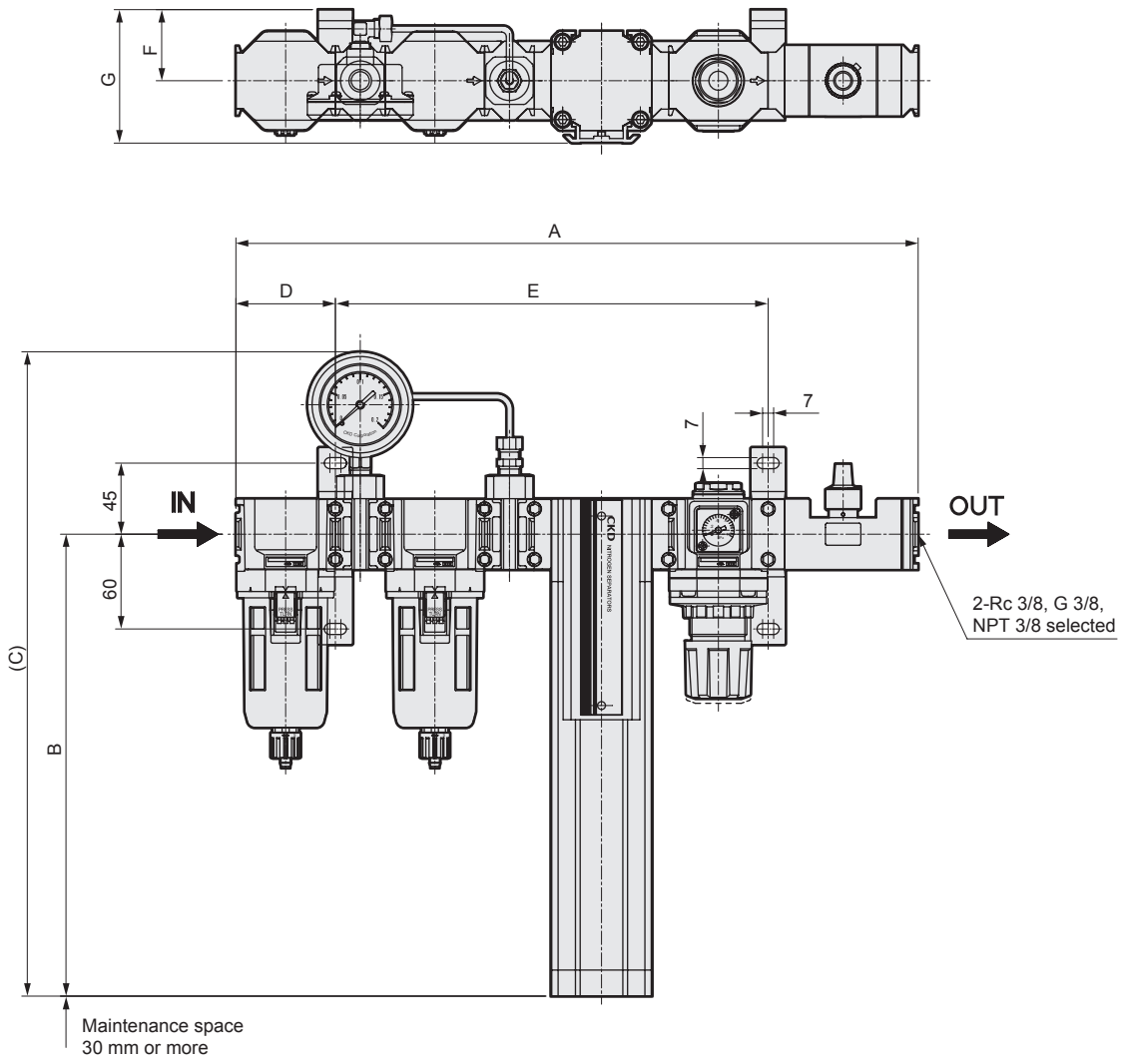
■ FP1 (with port size Rc3/8)

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	
(7) Needle valve	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

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

Dimensions

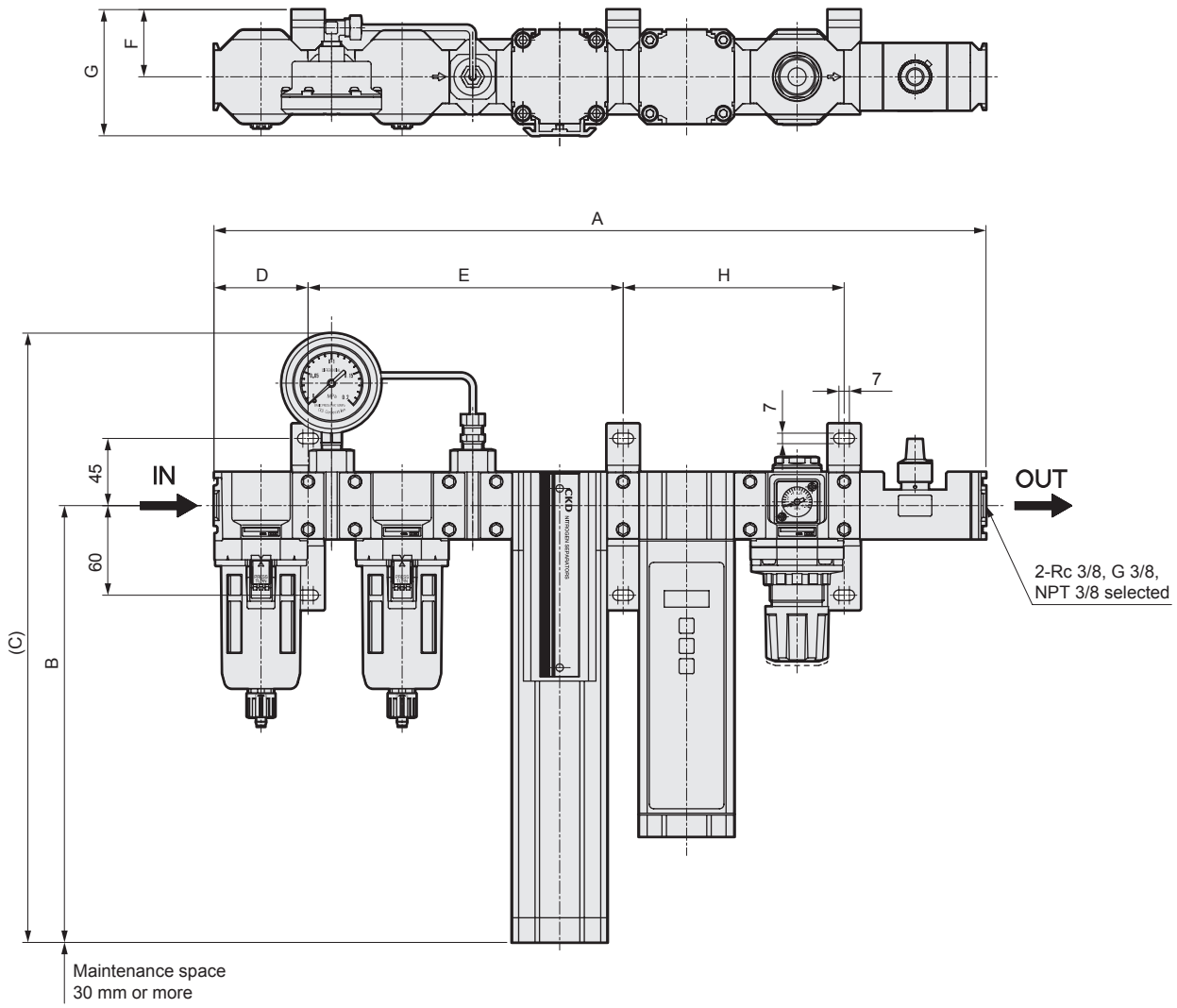
● Without inline oxygen monitor



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

Material compatible with the Food Sanitation Act

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.L. units

RoHS

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 *Note: There is a ±0.01% O_2 read accuracy that will be reflected in the display.
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
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

PNA- 10A - N - FP2

Ⓐ Port size
Ⓑ Traceability

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

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

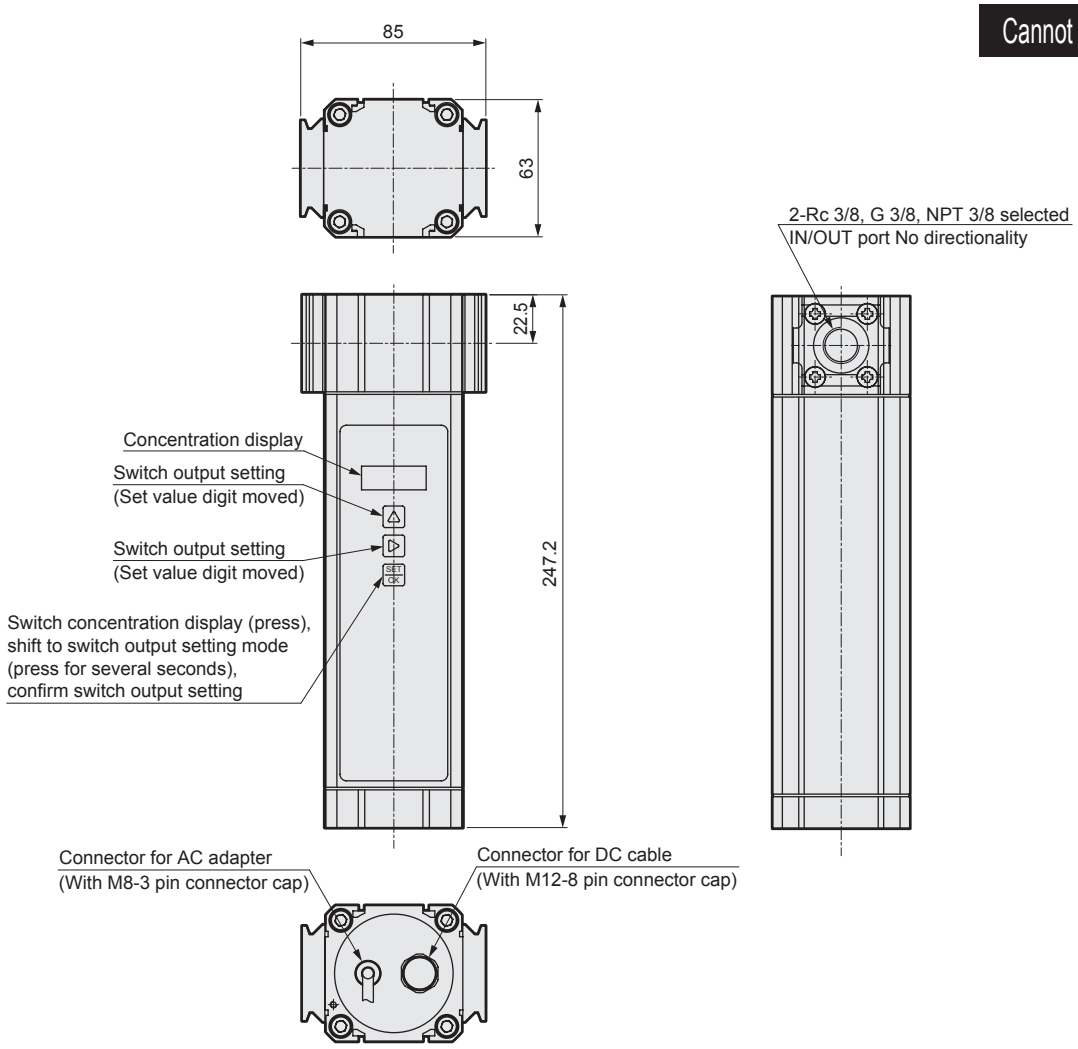
[Example of model No.]

PNA-10A-M-FP2

Ⓐ Port size: Rc3/8
Ⓑ Traceability: With traceability certificate, series variation diagram, and company certification

Dimensions

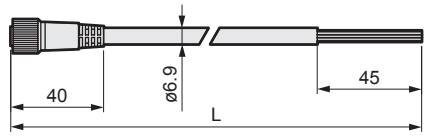
Cannot be disassembled



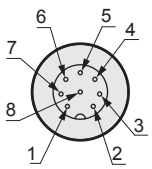
Connector cable dimensions

● DC cable

Connector cable model No: **PNA-1D, 3D, 5D**



Model No.	Dimension L
PNA-1D	1000
PNA-3D	3000
PNA-5D	5000

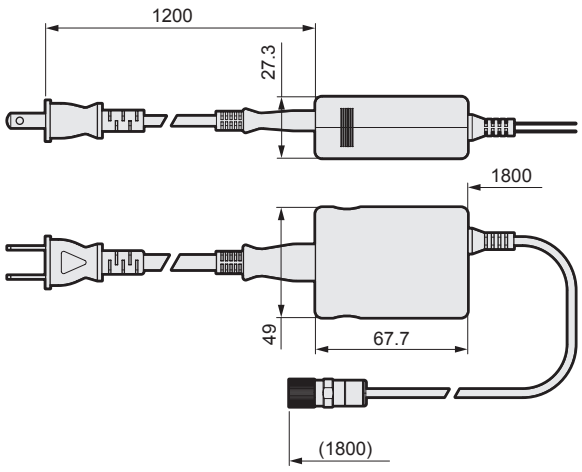


No.	Cable color	Content
1	White	Power supply +
2	Brown	Power supply -
3	Green	Analog output +
4	Yellow	Analog output -
5	Gray	Contact output (relay output)
6	Pink	Contact output (relay output)
7	Blue	-
8	-	-

● AC adapter

Connector cable model No: **PNA-A**

Voltage 100 to 240 VAC supported



Connector cable + conversion plug set model No.: **PNA-AG**

*Supports B, C, D, BF types

Material compatible with the Food Sanitation Act

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)	Nitrogen concentration (%)	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)	Nitrogen concentration (%)	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

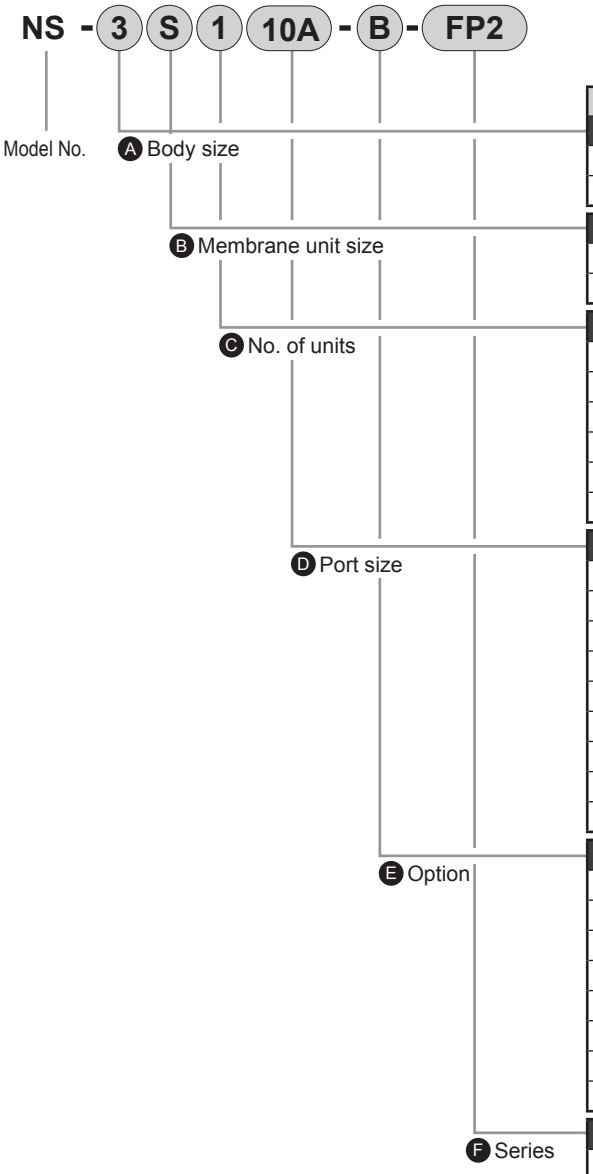
STEP 7 Find the inlet air flow rate from the rated outlet nitrogen gas flow rate of each model.
Inlet air flow rate of the model selected in STEP 4 x (3) temperature air flow rate compensation coefficient x (4) pressure air flow rate compensation coefficient = compensated inlet air flow rate ℓ/min (ANR)
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).

How to order

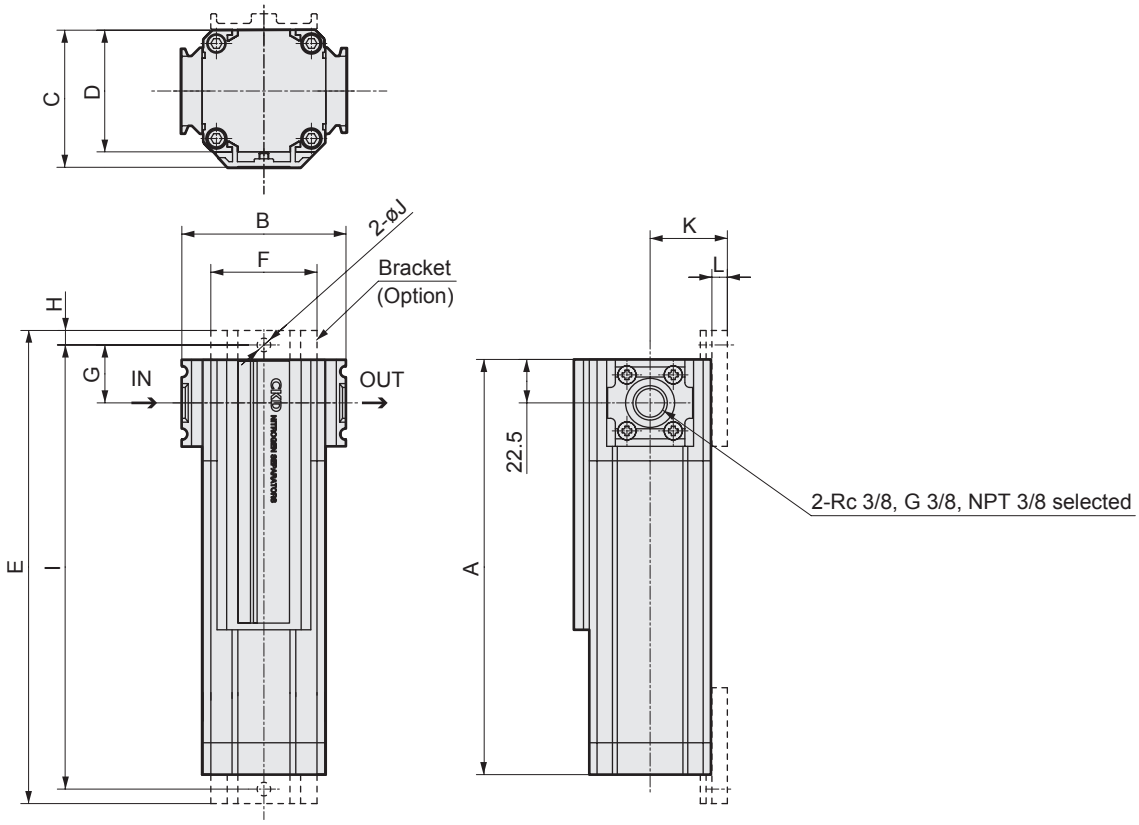


Code	Content
A Body size	
3	Body width 63
4	Body width 79
B Membrane unit size	
S	Short
L	Long
C No. of units	***1**
1	1 pc.
2	2 (available with NS-4S, 4L)
3	3 (available with NS-4S, 4L)
6	6 (available with NS-4S, 4L)
8	8 (available with NS-4S, 4L)
A	10 (available with NS-4S)
D Port size	
10A	Rc 3/8 (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**
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	
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.

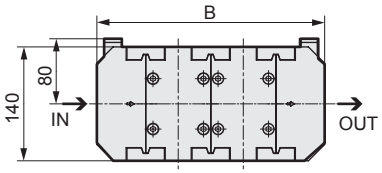
Dimensions

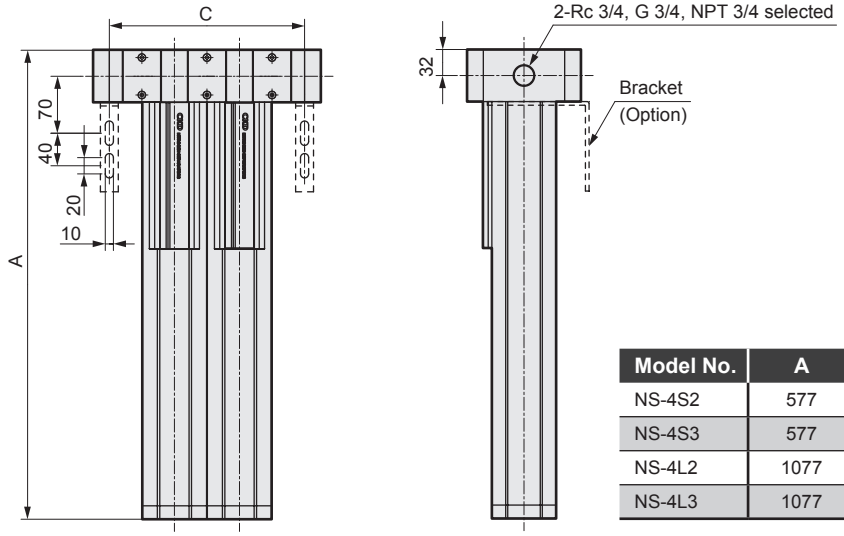


Model No.	A	B	C	D	Weight (kg)	Relative bracket dimensions							
						E	F	G	H	I	J	K	L
NS-3S1	315	85	71	63	1.8	345	55	30	7.5	330	7	40	8
NS-3L1	565	85	71	63	2.7	595	55	30	7.5	580	7	40	8
NS-4S1	565	100	90	79	4.0	605	70	32.5	10	585	9	50	10
NS-4L1	1065	100	90	79	6.8	1105	70	32.5	10	1085	9	50	10

Dimensions

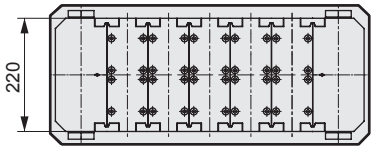
● 2 or 3 units

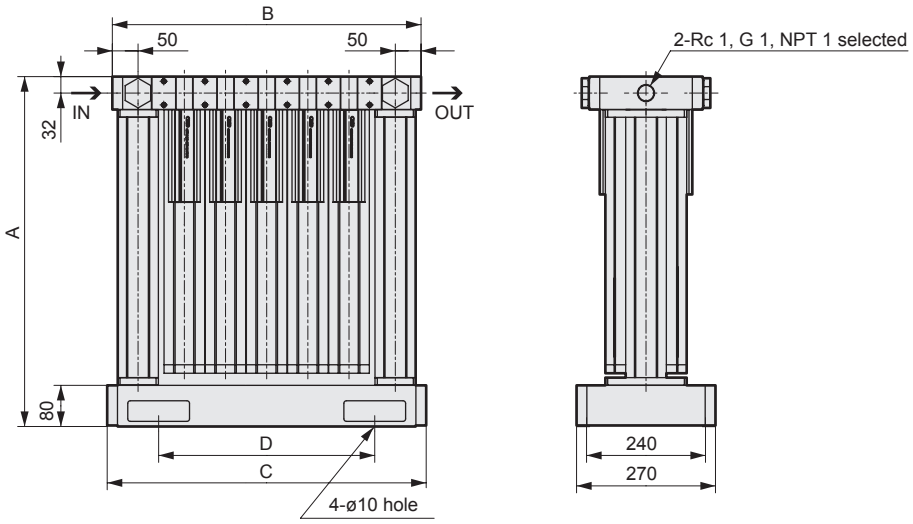




Model No.	A	B	C	Weight (kg)
NS-4S2	577	280	240	12
NS-4S3	577	360	320	17
NS-4L2	1077	280	240	18
NS-4L3	1077	360	320	25

● 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