CKD

SM-A09607-A

INSTRUCTION MANUAL

NITROGEN GAS EXTRACTION UNIT

SYSTEM TYPE

NSU series

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

APR-2021 Ver.4
CKD Corporation

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.
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 in general industrial machinery equipment or parts.
   It is not intended for use outdoors (except for products with outdoor specifications) 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)
   Including the 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 the entire system 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 enough attention to possible water leakage and leakage of electricity.
   ④ When starting or restarting a machine or device that incorporates pneumatic components, make sure to secure system safety, such as pop-out prevention measures.

Warranty

1. Warranty period

Warranty period of this product is one year after purchase.

2. Scope of warranty

If any malfunction or damage occurs on the CKD's own responsibility within above warranty period, we will repair the product immediately free of charge.
However, the following are excluded from warranty.

① When using the product under the conditions or environment deviating from this specification.
② When the malfunction or damage results from mishandling or improper control.
③ When the malfunction is caused by factors other than CKD product.
④ When the product is used improperly.
⑤ When the malfunction or damage results from the modification of functions, structures or specifications which CKD is not involved in, or repairs which is not designated by CKD after delivery.
⑥ When the damage can be avoided if the machine and apparatus of your company which CKD product is installed in has functions and structures which commonly equipped with in the industry.
⑦ When the malfunction or damage results from unforeseeable causes with the technology applied at the time of delivery.
⑧ When the malfunction or damage results from fire, earthquake, flood, thunder, other natural disaster, pollution, salt hazard, gas hazard, abnormal voltage, abnormal water pressure or quality, congelation, or other external causes.
⑨ In the case of repair parts which are used excessively. (filter element, dessicant etc.)

The warranty refers to only delivered products. We do not warrant for any secondary damage or loss caused by the faults of delivered products.

This product is premised on transaction and use in Japan.

As for the warranty of the product which is exported outside Japan, the following are applied.

① CKD will repair the products which returned to our factory freight prepaid. (We do not compensate transportation cost)
② After repairing the product we will deliver it to the designated domestic place in Japan with domestic packaging specifications.

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1. INTRODUCTION

Thank you for purchasing CKD's **"Nitrogen gas extraction unit, system type".**
This manual explains basic points of installation, operation, etc. to have our Nitrogen gas extraction unit, system type perform at their best. Please read this Instruction Manual thoroughly and use the product properly.

Keep this Instruction Manual (with the warranty book) in a safe place and be careful not to lose it.
This manual is edited consisting of the following seven sections.

- PRODUCT
- CAUTION
- OPERATION
- INSTALLATION
- OPERATION START/STOP AND INSPECTION
- MAINTENANCE
- MODEL CODING

It is, of course, desirable that you read this manual through before start using the product. This manual is so edited that a certain idea will be conveyed by reading the related section only, first of all. For instance, just reading the section of the installation, in case that an immediate installation is mandatorily required.

2. PRODUCT

2-1. Specifications

Item				NSU-3S	NSU-3L	NSU-4S	NSU-4F	NSU-4L	NSU-4G	NSU-4H
Range of working conditions	Working fluid			Compressed air						
	Inlet air pressure		MPa	0.4 ~ 1.0 (*1)						
	Proof pressure		MPa	1.5						
	Inlet air temperature		℃	5 ~ 50						
	Relative humidity of inlet air		RH	50%						
	Ambient temperature		℃	5 ~ 50						
Rating	Inlet air pressure dew point		℃	10						
	Inlet air pressure		MPa	0.7						
	Inlet ari temperature		℃	25						
	Ambient temperature		℃	25						
Rated flow rate	Outlet nitrogen gas flow rate L/min (ANR) (*2)	Nitrogen concentration (%) or higher	99.9	1.9	5.6	11.0	20.9	30.6	31.9	49.0
			99	5.0	15.5	28.2	53.6	66.9	81.8	107.0
			97	8.9	28.7	49.9	94.8	118.1	159.7	189.0
			95	14.0	39.8	65.3	124.1	169.2	222.0	270.7
			90	27.0	78.1	137.3	260.9	313.5 (*6)	— (*7)	
	Inlet air flow rate L/min (ANR)		99.9	17.3	50.9	100.0	190.0	278.2	290.0	445.5
			99	20.9	64.6	117.5	223.3	278.8	340.8	445.8
			97	24.1	77.6	134.9	256.2	319.2	431.6	510.8
			95	31.2	88.5	145.2	275.8	376.0	493.3	601.6
			90	60.0	173.6	305.1	579.7	696.7 (*6)	— (*7)	
Air filter		Filtration rating μm		5.0						
Oil mist filter		Oil removal mg/m^3		0.01 or less (0.1 or less after oil saturation) (*3)						
Regulator		Set pressure range MPa		0.05 ~ 0.85						
Inline oxygen monitor (*4)		Measurement range $\%O_2$		0.00 ~ 25.00						
Flow sensor (*5)		Measurement flow rate range L/min		20 / 50 / 100 / 200 / 500						
Standard accessories				Pressure gauge, Differential pressure gauge, Bracket						

*1. Inlet air pressure when NS-QFS-E is assembled is 0.4 to 0.75MPa.
*2. When the membrane unit size "H" is selected and the inlet air temperature is 50°C, the outlet flow rate with nitrogen gas concentration of 99.9% should be 39 L/min or less. Contact CKD when working beyond the specified range.
*3. The measured value when primary oil concentration is 30 mg/m^3 at 21°C.
*4. For the specifications and handling of the inline oxygen monitor, refer to the instruction manual SM-A10371-A for the inline oxygen monitor.
*5. For the specifications and handling of the flow sensor, refer to the instruction manual SM-A30482-A for the flow sensor.
*6. When the membrane unit size "L" is selected and the outlet nitrogen gas with a concentration of 90% is used, inlet air temperature should be 40°C or less. Contact CKD if you want to use the product when inlet air temperature is above 40°C.
*7. When the membrane unit size "G" or "H" is selected, please contact CKD if you want to use the outlet nitrogen gas with a concentration of 90%.

Components

■Standard（Port size Rc 3/8）

Unit model No.	NSU-3S□	NSU-3L□	NSU-4S□	NSU-4F□	NSU-4L□	NSU-4G□	NSU-4H□
Air filter	F3000-10-W-F		F4000-10-W-F				
Oil mist filter	M3000-10-W-F1		M4000-10-W-F1				
Differential pressure gauge	GA400-8-P02						
Membrane unit	NS-3S110A -□	NS-3L110A -□	NS-4S110A -□	NS-4S110A -□ NS-4S110A -□	NS-4L110A -□	NS-4L110A -□ NS-4S110A -□	NS-4L110A -□ NS-4L110A -□
Inline oxygen monitor	PNA-10A-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-FP1		NS-QR4-FP1				
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（Port size Rc 3/8）

Unit model No.	NSU-3S□-FP1	NSU-3L□-FP1	NSU-4S□-FP1	NSU-4F□-FP1	NSU-4L□-FP1	NSU-4G□-FP1	NSU-4H□-FP1
Air filter	F3000-10-W-F-FP1		F4000-10-W-F-FP1				
Oil mist filter	M3000-10-W-F1-FP1		M4000-10-W-F1-FP1				
Differential pressure gauge	GA400-8-P02						
Membrane unit	NS-3S110A -□-FP2	NS-3L110A -□-FP2	NS-4S110A -□-FP2	NS-4S110A -□-FP2 NS-4S110A -□-FP2	NS-4L110A -□-FP2	NS-4L110A -□-FP2 NS-4S110A -□-FP2	NS-4L110A -□-FP2 NS-4L110A -□-FP2
Inline oxygen monitor	PNA-10A-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-FP1		NS-QR4-FP1				
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		

■Standard（Port size G 3/8）

Unit model No.	NSU-3S□	NSU-3L□	NSU-4S□	NSU-4F□	NSU-4L□	NSU-4G□	NSU-4H□
Air filter	F3000-10G-W-F		F4000-10G-W-F				
Oil mist filter	M3000-10G-W-F1		M4000-10G-W-F1				
Differential pressure gauge	GA400-8-PB02						
Membrane unit	NS-3S110B -□	NS-3L110B -□	NS-4S110B -□	NS-4S110B -□ NS-4S110B -□	NS-4L110B -□	NS-4L110B -□ NS-4S110B -□	NS-4L110B -□ NS-4L110B -□
Inline oxygen monitor	PNA-10B-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-10G-FP1		NS-QR4-10G-FP1				
Needle valve	NS-QDVL-020-10G NS-QDVL-080-10G	NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G	NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G NS-QDVL-240-10G		NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G NS-QDVL-240-10G NS-QDVL-400-10G		

■FP1（Port size G 3/8）

Unit model No.	NSU-3S□-FP1	NSU-3L□-FP1	NSU-4S□-FP1	NSU-4F□-FP1	NSU-4L□-FP1	NSU-4G□-FP1	NSU-4H□-FP1
Air filter	F3000-10G-W-FP1-FLA11105		F4000-10G-W-FP1-FLA11177				
Oil mist filter	M3000-10G-W-FP1-FLA11181		M4000-10G-W-FP1-FLA11183				
Differential pressure gauge	GA400-8-PB02						
Membrane unit	NS-3S110B -□-FP2	NS-3L110B -□-FP2	NS-4S110B -□-FP2	NS-4S110B -□-FP2 NS-4S110B -□-FP2	NS-4L110B -□-FP2	NS-4L110B -□-FP2 NS-4S110B -□-FP2	NS-4L110B -□-FP2 NS-4L110B -□-FP2
Inline oxygen monitor	PNA-10B-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-10G-FP1		NS-QR4-10G-FP1				
Needle valve	NS-QDVL-020-10G NS-QDVL-080-10G	NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G	NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G NS-QDVL-240-10G		NS-QDVL-020-10G NS-QDVL-080-10G NS-QDVL-160-10G NS-QDVL-240-10G NS-QDVL-400-10G		

■Standard（Port size NPT 3/8）

Unit model No.	NSU-3S□	NSU-3L□	NSU-4S□	NSU-4F□	NSU-4L□	NSU-4G□	NSU-4H□
Air filter	F3000-10N-W-F		F4000-10N-W-F				
Oil mist filter	M3000-10N-W-F1		M4000-10N-W-F1				
Differential pressure gauge	GA400-8-PS02						
Membrane unit	NS-3S110C -□	NS-3L110C -□	NS-4S110C -□	NS-4S110C -□ NS-4S110C -□	NS-4L110C -□	NS-4L110C -□ NS-4S110C -□	NS-4L110C -□ NS-4L110C -□
Inline oxygen monitor	PNA-10C-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-10N-FP1		NS-QR4-10N-FP1				
Needle valve	NS-QDVL-020-10N NS-QDVL-080-10N	NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N	NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N NS-QDVL-240-10N		NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N NS-QDVL-240-10N NS-QDVL-400-10N		

■FP1（Port size NPT 3/8）

Unit model No.	NSU-3S□-FP1	NSU-3L□-FP1	NSU-4S□-FP1	NSU-4F□-FP1	NSU-4L□-FP1	NSU-4G□-FP1	NSU-4H□-FP1
Air filter	F3000-10N-W-FP1-FLA11105		F4000-10N-W-FP1-FLA11177				
Oil mist filter	M3000-10N-W-FP1-FLA11181		M4000-10N-W-FP1-FLA11183				
Differential pressure gauge	GA400-8-PS02						
Membrane unit	NS-3S110C -□-FP2	NS-3L110C -□-FP2	NS-4S110C -□-FP2	NS-4S110C -□-FP2 NS-4S110C -□-FP2	NS-4L110C -□-FP2	NS-4L110C -□-FP2 NS-4S110C -□-FP2	NS-4L110C -□-FP2 NS-4L110C -□-FP2
Inline oxygen monitor	PNA-10C-□-FP2						
Flow sensor	NS-QFS-□						
Regulator	NS-QR3-10N-FP1		NS-QR4-10N-FP1				
Needle valve	NS-QDVL-020-10N NS-QDVL-080-10N	NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N	NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N NS-QDVL-240-10N		NS-QDVL-020-10N NS-QDVL-080-10N NS-QDVL-160-10N NS-QDVL-240-10N NS-QDVL-400-10N		

2-2. Selection guide
〈Model selection method〉

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.

STEP1 Confirm the use conditions and the rated values in the specifications.

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

STEP2 Confirm the compensation coefficient for outlet nitrogen gas flow rate affectedby inlet air temperature.

(1) Temperature – Gas flow rate compensation coefficient

Temperature (°C)	Outlet nitrogen gas concentration				
	99.9%	99%	97%	95%	90%
5	0.64	0.79	0.79	0.75	0.78
10	0.73	0.84	0.84	0.81	0.84
25	1	1	1	1	1
35	0.97	1.05	1.04	1.07	1.07
40	0.95	1.08	1.06	1.11	1.11
50	0.9	1.09	1.11	1.15	1.2

STEP3 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

STEP4 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 outlet nitrogen gas flow rate.
Select body size and membrane unit size with sufficient refined nitrogen gas flow rate after correction with the above formula.

STEP5 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 STEP1, select the needle from the needle flow rate characteristic.

STEP6 Select the model from STEP4 and STEP5.

STEP7 Confirm the compensation coefficient for inlet air flow rate affected by inlet air temperature.

(3) Temperature – Air flow rate correction coefficient

Temperature (°C)	Outlet nitrogen gas concentration				
	99.9%	99%	97%	95%	90%
5	0.73	0.68	0.75	0.69	0.76
10	0.8	0.76	0.81	0.77	0.82
25	1	1	1	1	1
35	1.21	1.17	1.11	1.13	1.11
40	1.32	1.25	1.17	1.2	1.16
50	2.05	1.38	1.31	1.31	1.3

STEP8 Confirm the compensation coefficient for inlet air flow rate affected by inlet air pressure.

(4) Pressure- Air flow rate correction 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

STEP9 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.

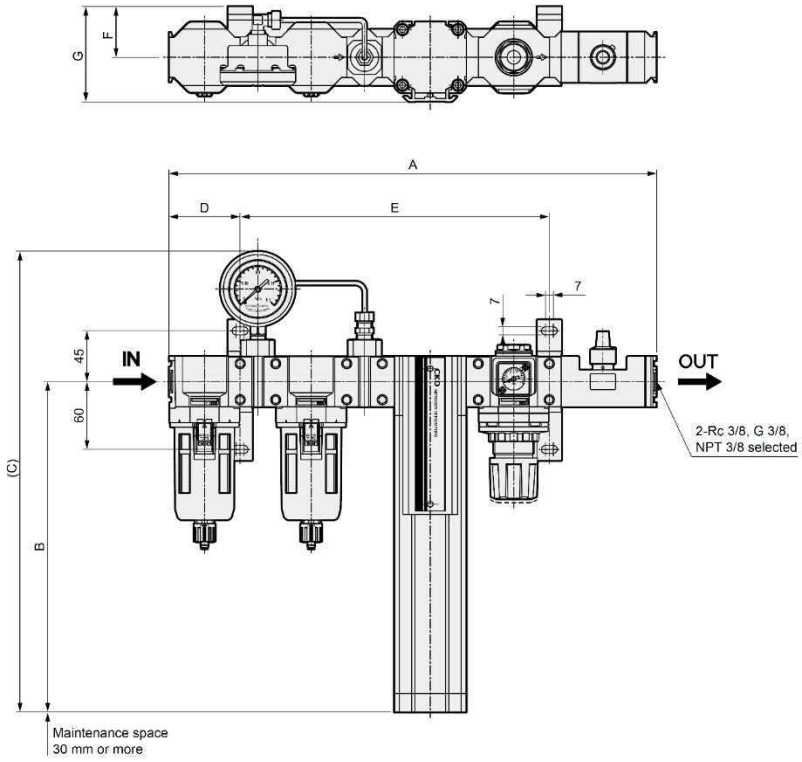
Example of calculation

Conditions	Working conditions	Selecting conditions	Correction coefficient for outlet nitrogen gas flow rate	Correction coefficient for inlet air flow rate
Outlet nitrogen gas flow rate	50 L/min (ANR)	50 L/min (ANR)	-	-
Outlet nitrogen gas concentration	99%	99%	-	-
Outlet nitrogen gas 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 MPa to 0.7MPa	0.6 MPa	(2)0.75	(4)0.91

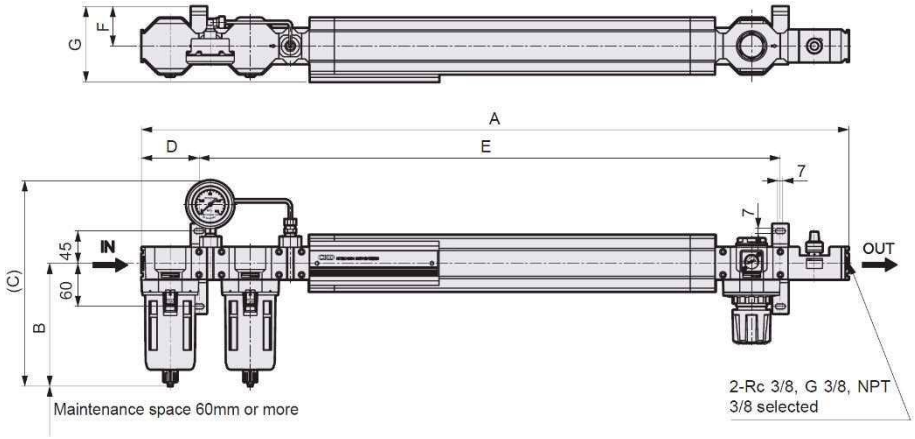
Calculate the following and select according to the above conditions.
From the formula 50(outlet nitrogen gas flow rate)÷1.08÷0.75＝61.7 L/min(ANR), the specification field shows that NSU-4L has sufficient flow rate and is the proper size.
For needle size, select NS-QDVL-160 at 0.2 MPa, which can be adjusted 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).

2-3. Dimensions

●1-station type, no inline oxygen monitor and flow sensor

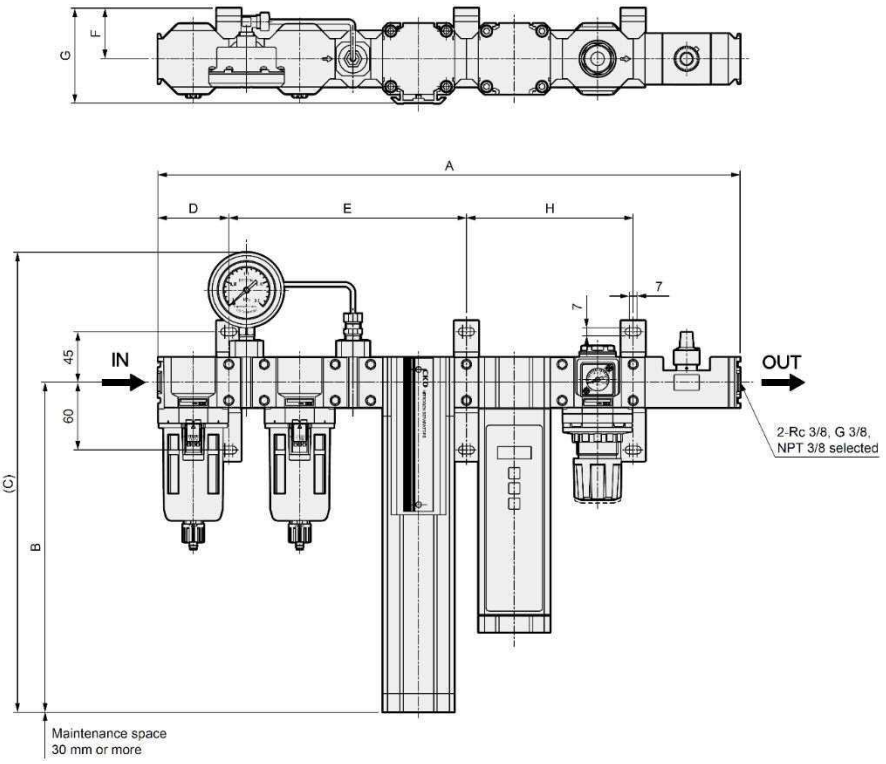


Model No.	A	B	C	D	E	F	G	Weight (kg)
NSU-3S*10*NN	432	293	408	63	274	45	85	4.0
NSU-3L*10*NN	432	543	658	63	274	45	85	4.9
NSU-4S*10*NN	498	543	658	80	323	55	106	6.9
NSU-4L*10*NN	498	1043	1158	80	323	55	106	9.7

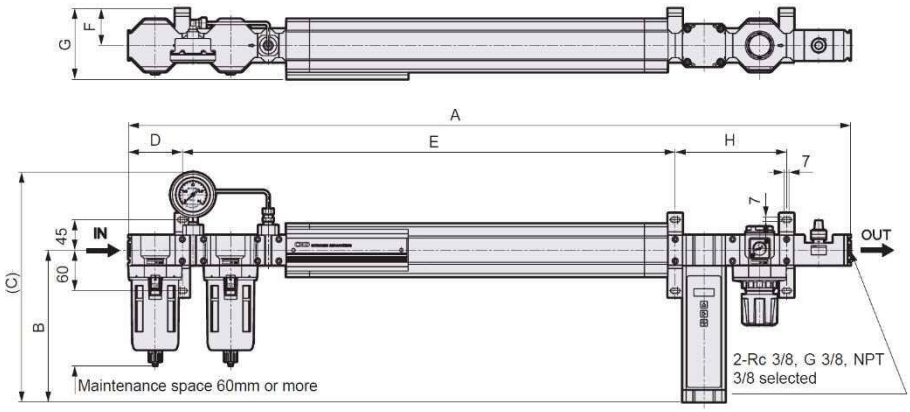


Model No.	A	B	C	D	E	F	G	Weight (kg)
NSU-4S*10*NN-*T	985	171	286	80	810	55	106	7.1
NSU-4L*10*NN-*T	1485	171	286	80	1310	55	106	9.9

●1-station type, with inline oxygen monitor, no flow sensor

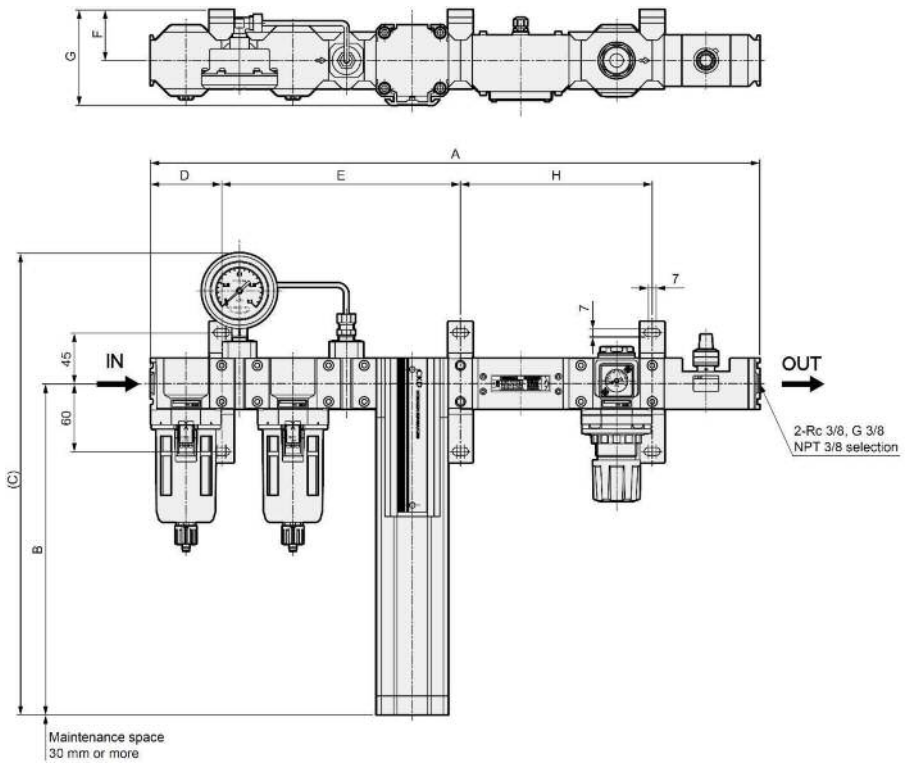


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-3S*10*A*	517	293	408	63	211	45	85	148	5.6
NSU-3L*10*A*	517	543	658	63	211	45	85	148	6.5
NSU-4S*10*A*	583	543	658	80	243	55	106	165	8.5
NSU-4L*10*A*	583	1043	1158	80	243	55	106	165	11.3

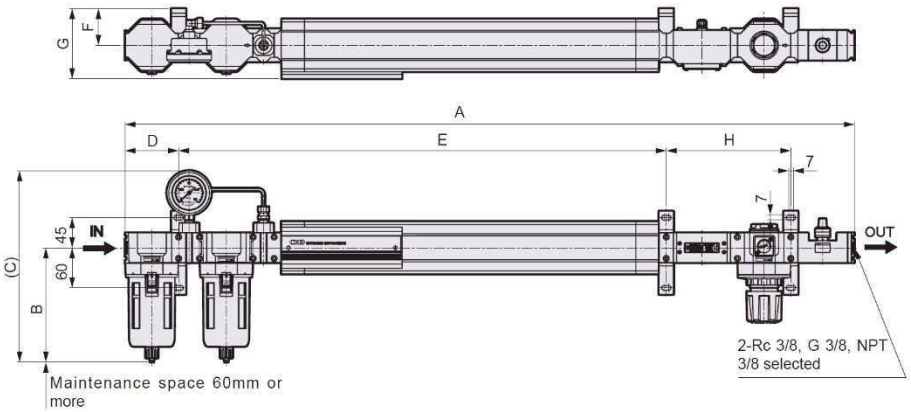


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4S*10*A*-*T	1070	225	340	80	730	55	106	165	8.7
NSU-4L*10*A*-*T	1570	225	340	80	1230	55	106	165	11.5

●1-station type, no inline oxygen monitor, with flow sensor

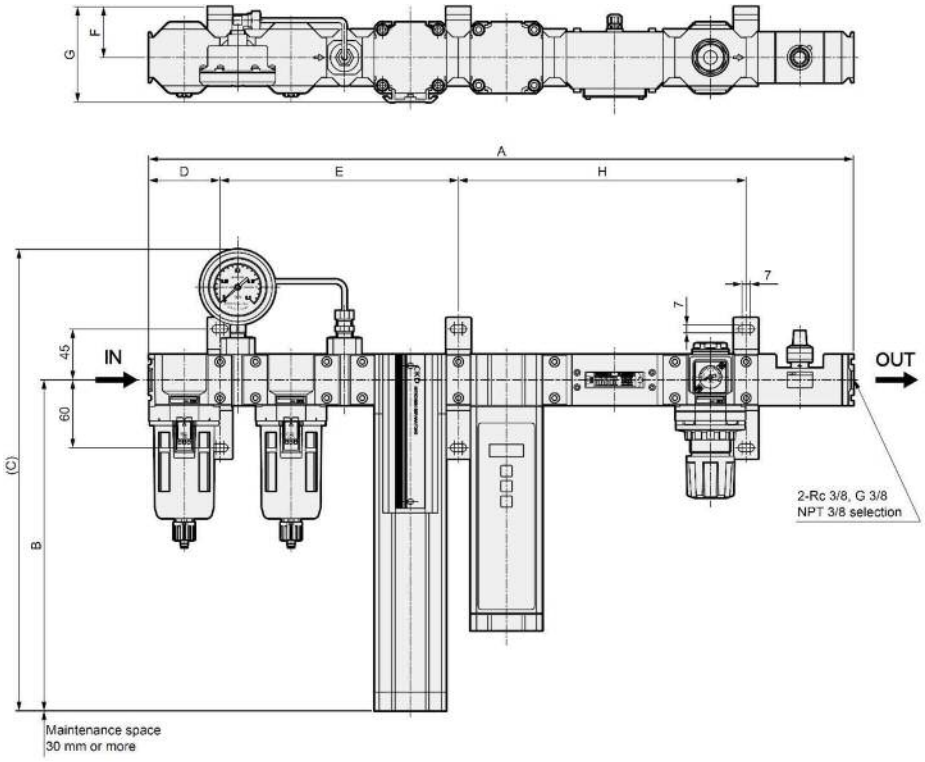


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-3S*10*B*	538.5	293	408	63	211	45	85	169.5	4.8
NSU-3L*10*B*	538.5	543	658	63	211	45	85	169.5	5.7
NSU-4S*10*B*	604.5	543	658	80	243	55	106	186.5	7.7
NSU-4L*10*B*	604.5	1043	1158	80	243	55	106	186.5	10.5

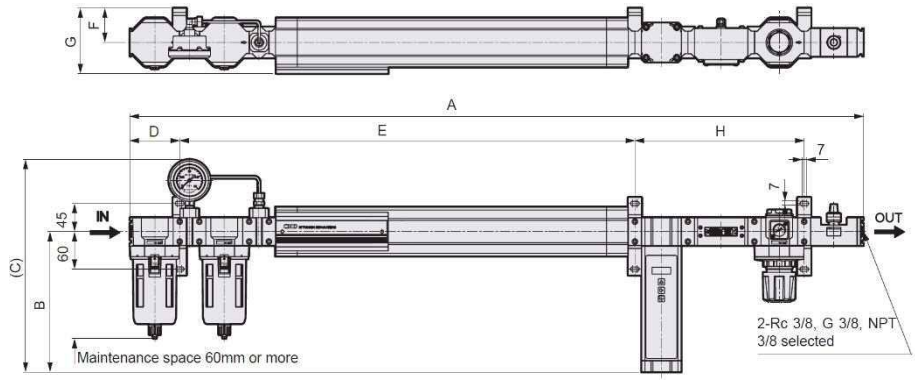


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4S*10*B*-*T	1091.5	171	286	80	730	55	106	186.5	7.9
NSU-4L*10*B*-*T	1591.5	171	286	80	1230	55	106	186.5	10.7

●1-station type, with inline oxygen monitor and flow sensor

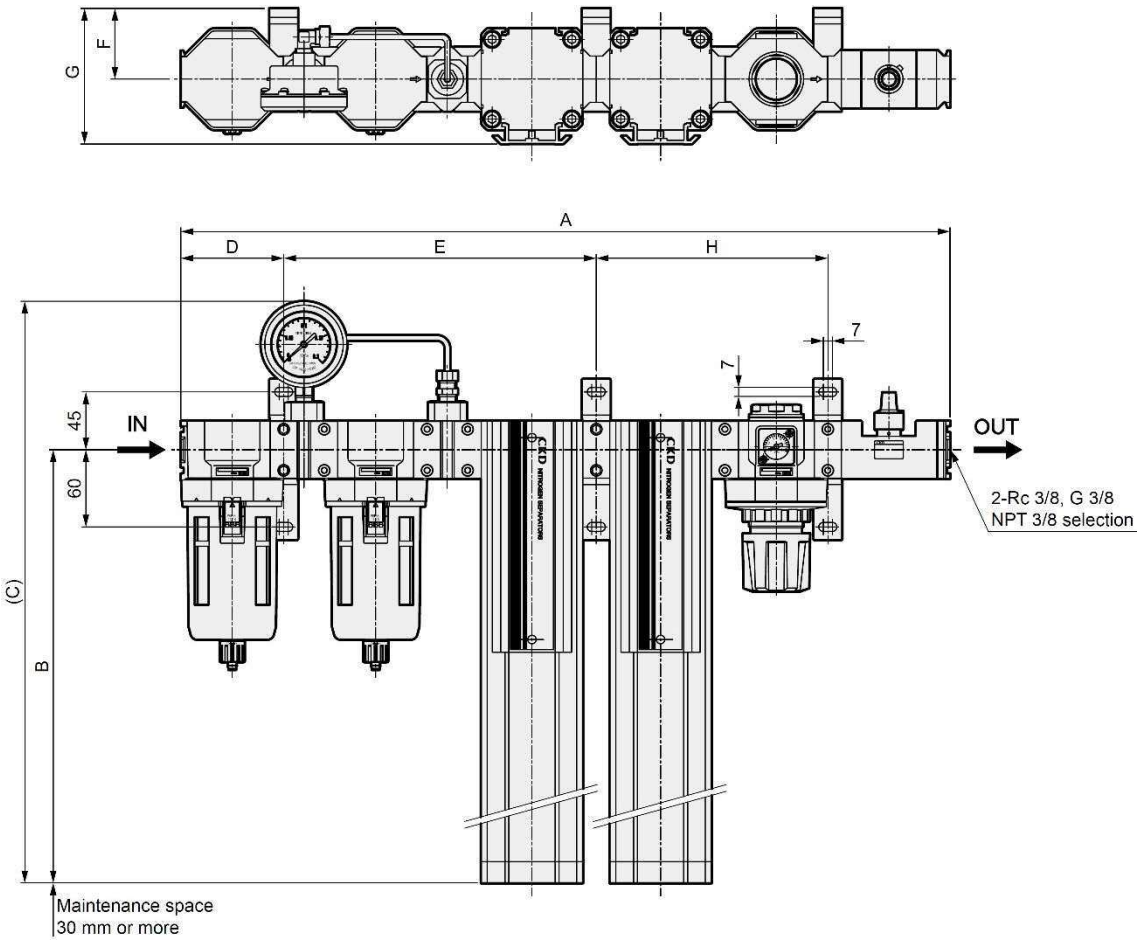


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-3S*10*C*	623.5	293	408	63	211	45	85	254.5	6.4
NSU-3L*10*C*	623.5	543	658	63	211	45	85	254.5	7.3
NSU-4S*10*C*	689.5	543	658	80	243	55	106	271.5	9.3
NSU-4L*10*C*	689.5	1043	1158	80	243	55	106	271.5	12.1



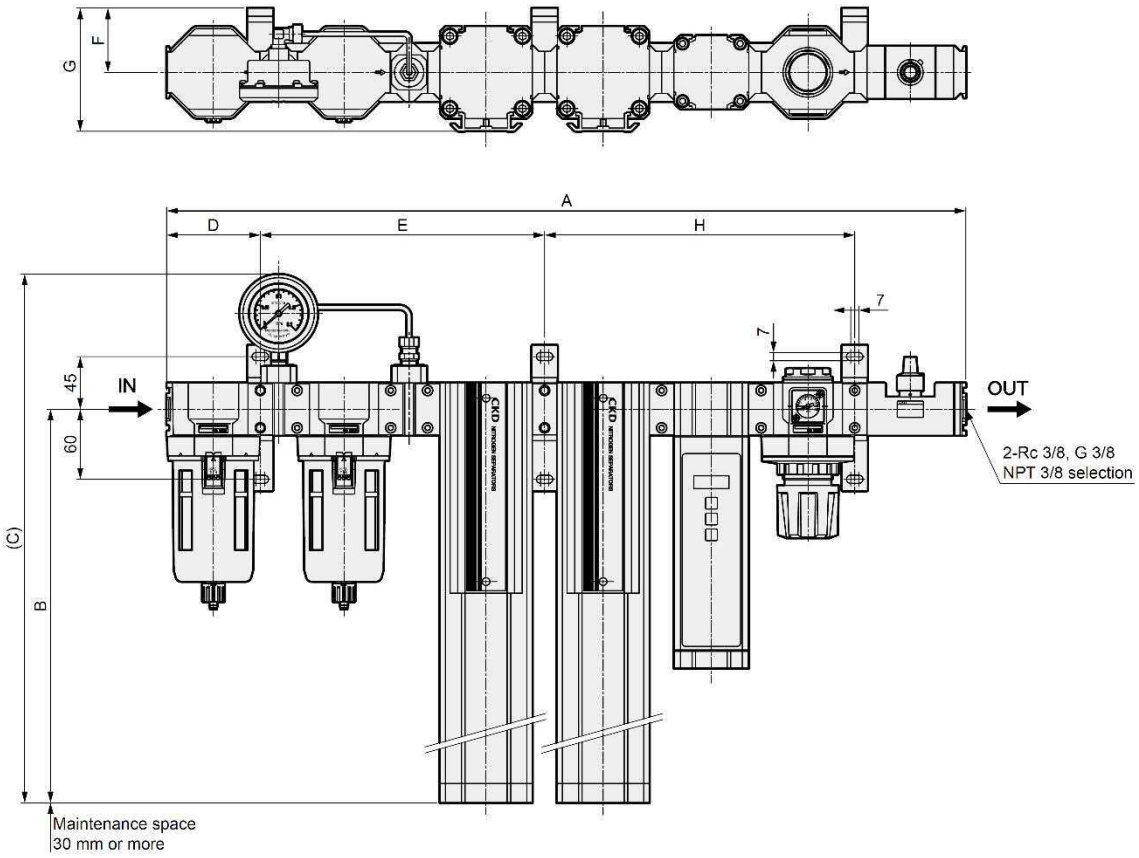
Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4S*10*C*-*T	1176.5	225	340	80	730	55	106	271.5	9.5
NSU-4L*10*C*-*T	1676.5	225	340	80	1230	55	106	271.5	12.3

●2-station type, no inline oxygen monitor and flow sensor



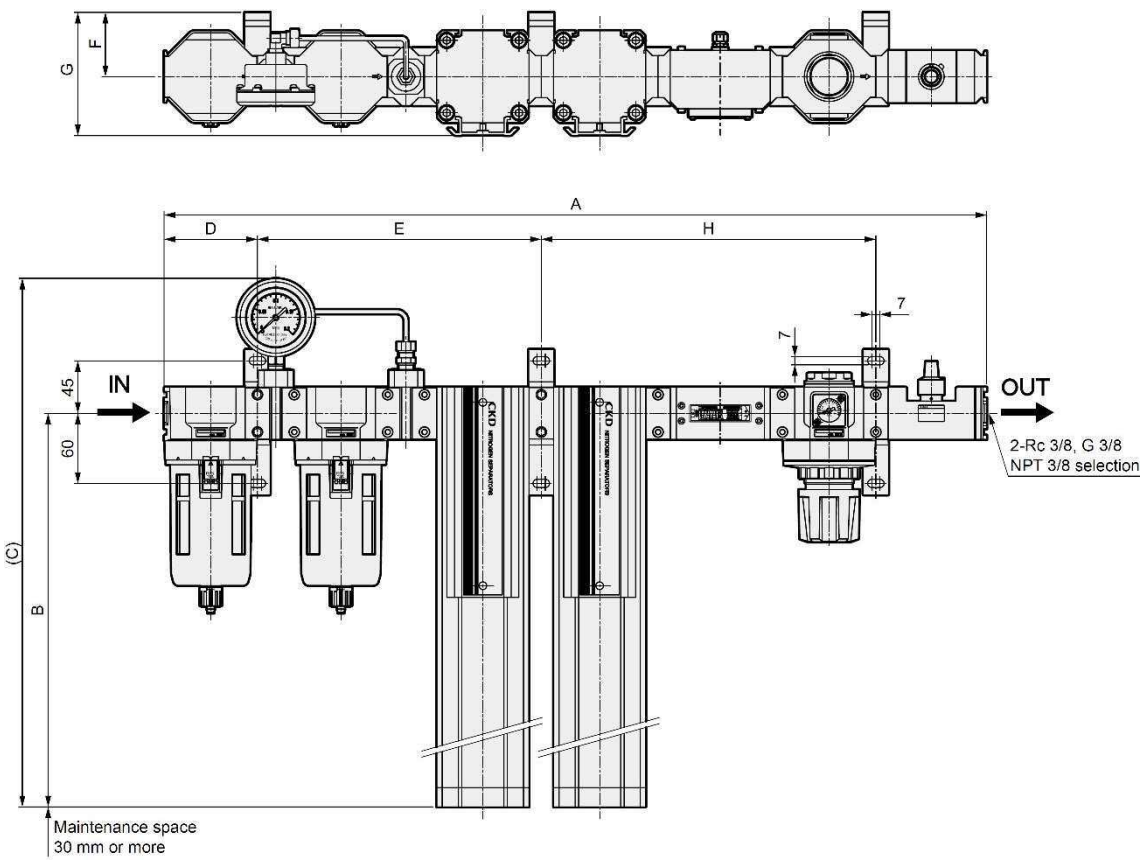
Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4F*10*NN	598	543	658	80	243	55	106	180	10.9
NSU-4G*10*NN	598	1043	1158	80	243	55	106	180	13.7
NSU-4H*10*NN	598	1043	1158	80	243	55	106	180	16.5

●2-station type, with inline oxygen monitor, no flow sensor



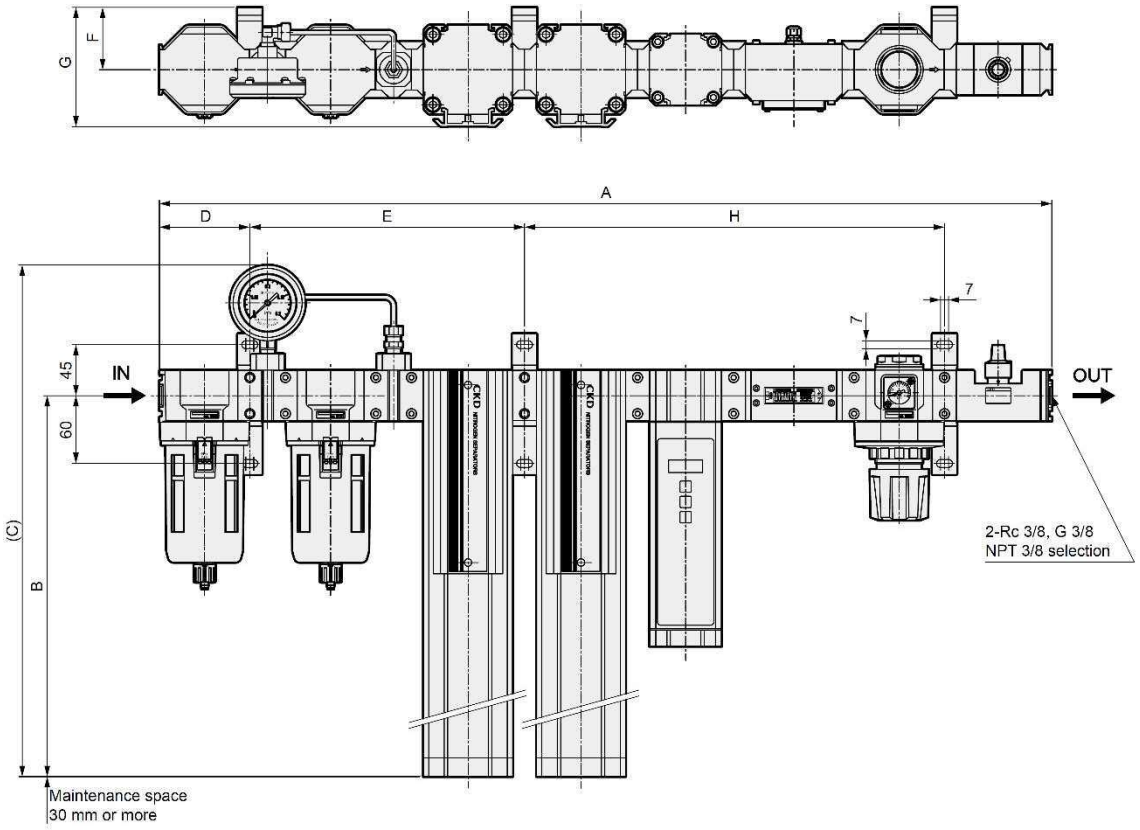
Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4F*10*A*	683	543	658	80	243	55	106	265	12.5
NSU-4G*10*A*	683	1043	1158	80	243	55	106	265	15.3
NSU-4H*10*A*	683	1043	1158	80	243	55	106	265	18.1

●2-station type, no inline oxygen monitor, with flow sensor



Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4F*10*B*	704.5	543	658	80	243	55	106	286.5	11.7
NSU-4G*10*B*	704.5	1043	1158	80	243	55	106	286.5	14.5
NSU-4H*10*B*	704.5	1043	1158	80	243	55	106	286.5	17.3

●2-station type, with inline oxygen monitor and flow sensor

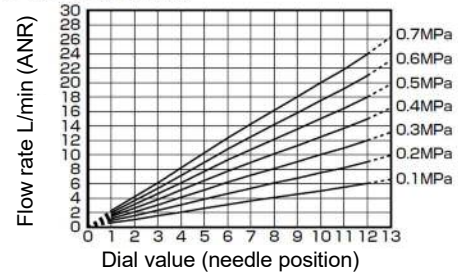


Model No.	A	B	C	D	E	F	G	H	Weight (kg)
NSU-4F*10*C*	789.5	543	658	80	243	55	106	371.5	13.3
NSU-4G*10*C*	789.5	1043	1158	80	243	55	106	371.5	16.1
NSU-4H*10*C*	789.5	1043	1158	80	243	55	106	371.5	18.9

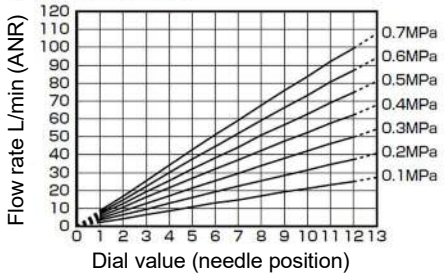
2-4. Needle valve flow characteristics

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

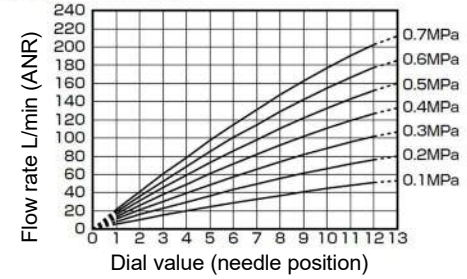
● NS-QDVL-020



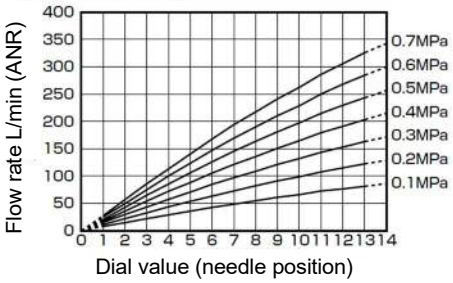
● NS-QDVL-080



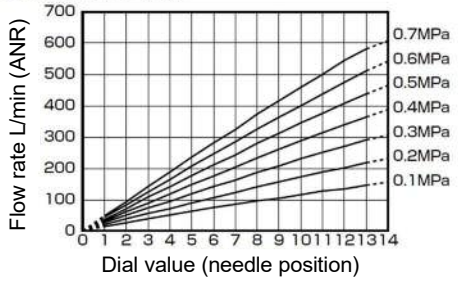
● NS-QDVL-160



● NS-QDVL-240



● NS-QDVL-400



3. CAUTION

3-1. Chemical Resistance of Plastic Bowls

Prevent installation of bowls within the following chemical periphery because the bowls are made of polycarbonate.

Types of chemicals	Categories of chemicals	Main products of chemicals	General applications
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 compound	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

3-2. Others

1. Working environment

1) Avoid installing this product where it will be subject to direct sunlight or rain.
2) Avoid use in environments where ozone is generated.
3) Avoid using this product where vibration and impact are present.
4) 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).)
5) 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.).
6) Use within ambient temperature of 5 to 50°C.
7) Keep operating pressure below 1.0 MPa (Inline oxygen monitor / flow sensor option "BE", "CE", "CK" selected: 0.75MPa).
8) Avoid installation close to welding or spray painting areas.
9) In case of hydrocarbons may be contained in compressed air, install activated carbon filter inside this unit (For the type in which activated carbon particles flow to the secondary side, please install the oil mist filter on the secondary side of the activated carbon filter).

2. Warning

1) 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.
2) 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.
3) Do not use the product for any purpose directly related to human life.
4) This product was designed to obtain nitrogen-enriched gas from compressed air. Do not use it for any purpose other than this purpose.
5) Do not remodel this product.
6) Do not step onto the body.
7) Note that it takes time to obtain the required nitrogen concentration after supplying compressed air.

3. Caution of needle valve with adjusting dial

1) To adjust the flow rate, turn the dial to the right to open or the left to close.
2) After adjustment, lock the dial with the sliding lock lever.
3) 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.
4) 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.
5) Do not remove the dial from the body. If the dial is removed, readjustment and calibration of flow characteristics cannot be performed.
6) The needle valve cannot be used as a stop valve requiring zero leakage. Due to the specifications of the product, some leakage is allowed.
7) Dust cannot be completely kept out of the flow path. Install a final clean filter if dust could be a problem with the circuit. (When using the Food processing, install a bacteria removing/antibacterial filter.)
8) Operation of the needle valve may wear internal parts. If there is an effect, please perform necessary processing such as installing a filter on the secondary side.

4. OPERATION

4-1. Pressure setting

1) Pull down knob and rotate it after confirming not locked. (Refer to Fig.1)
2) Rotating H-direction (Clockwise) increases pressure, while L-direction (Counter-Clockwise) for decrease. (Refer to Fig.2)
3) Knob cannot be rotated when they are pushed to be locked. (Refer to Fig.2)

NOTE: Use in setting pressure range. Pressure setting higher than primarily pressure cannot be obtained.

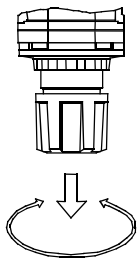


Fig.1

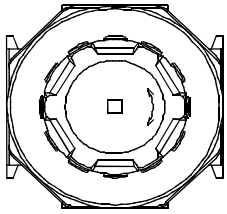


Fig.2

4-2. Drain discharge

1) Float type automatic discharger is built in the filter, so drain is discharged automatically when drain reaches a certain level.

2) When drain is discharged manually, rotate drain cock to O-side.

3) Confirm that cock is firmly closed after drain discharge by rotating to S-side. (Refer to Fig.3)

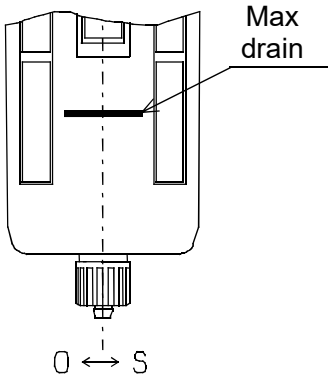
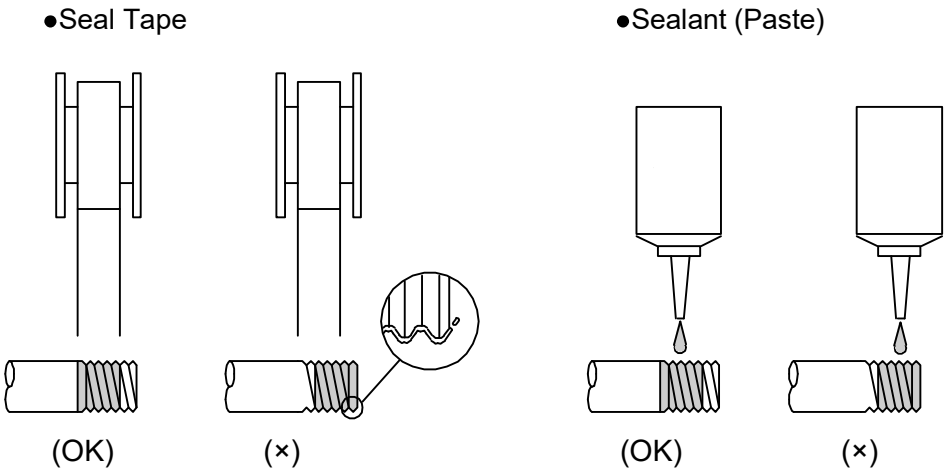


Fig.3

5. INSTALLATION

5-1. Piping

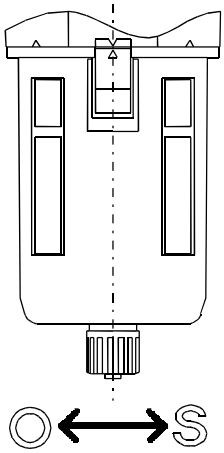
1) Ensure air flow coincides with the directional arrows on cover plate.
2) Flush air into the pipe to blow out foreign substances and chips before piping.
3) Refrain applying sealant or sealing tape approx. Two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



4) In case of Air filter/Oil mist filter

   Nylon tube of I.D. 5.7 mm to 6 mm can be connected to drain discharge port directly. Max length of the pipe is less than 5 m, and avoids upward piping.

   Connect tube, after confirming drain cock is firmly close, rotating cock to S-direction.



5-2. Installation

■ When the mounting direction ″No sign: Vertical mounting″ is selected.

1) Installation is made with mounting hole of T type bracket. Refer to outline drawing.
2) Install so that drain discharge port faces downward.
3) Install as close to the pneumatic equipment as possible.
4) Allow a minimum of 20 mm above the top and 30 mm below the unit for maintenance purpose. (Refer to Fig.4)
5) In case of the option E of NSU-3S,3L series, piping of exhaust air should use the hose or piping material of I.D. 8 mm or more, and give length as less than 3 m. (Refer to Fig.4)
6) In case of the option E of NSU-4S,4L series, piping of exhaust air should use the hose or piping material of I.D. 8.9 mm or more, and give length as less than 2 m. (Refer to Fig.5)

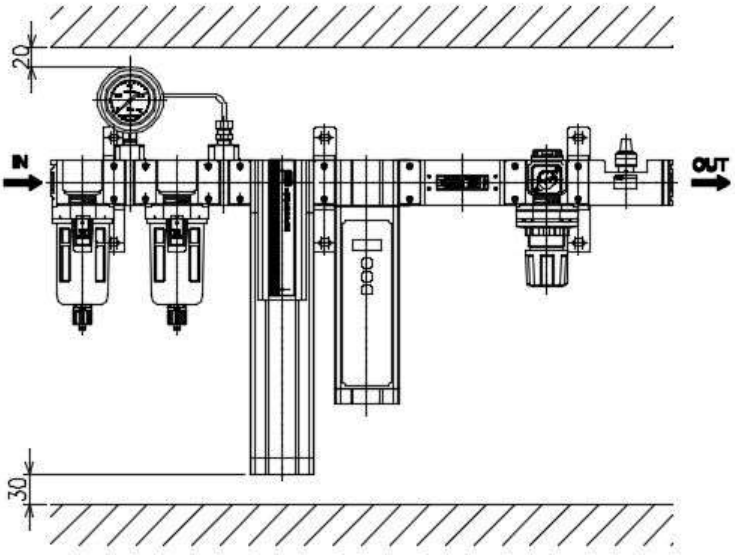


Fig.4

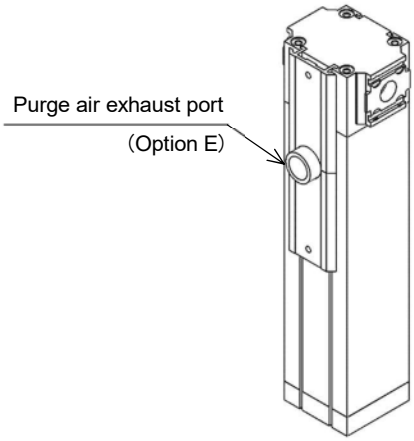


Fig.5

■ When the mounting direction "T: Horizontal mounting" is selected.

1) Installation is made with mounting hole of T type bracket. Refer to outline drawing.
2) Install so that drain discharge port faces downward.
3) Install as close to the pneumatic equipment as possible.
4) Allow a minimum of 20 mm above the top and 60 mm under the filter for maintenance purpose. (Refer to Fig.6)
   And allow a minimum of 60 mm under the inline oxygen monitor for wiring when the inline oxygen monitor is assembled.
5) In case of the option E, piping of exhaust air should use the hose or piping material of I.D. 8.9 mm or more, and give length as less than 2 m. (Refer to Fig.7)

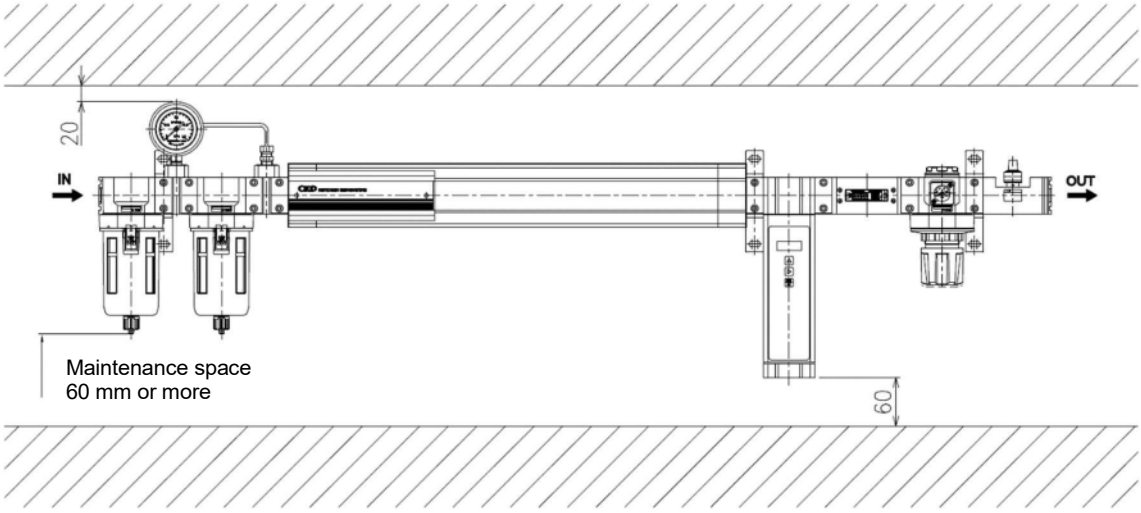


Fig.6

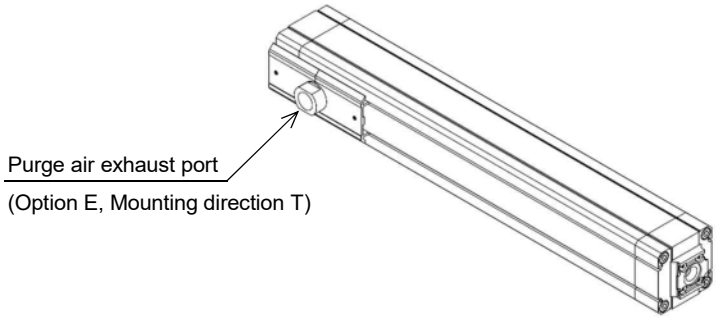


Fig.7

6. OPERATION START/STOP AND INSPECTION

6-1. Operation start/stop

〈Operation start〉

1) After the regulator and needle valve is fully closed, gradually open the primary side valve.
2) Set the secondary side of the regulator to 0.7 MPa or less, gradually open the needle valve and adjust to a predetermined outlet nitrogen gas flow rate and oxygen concentration.

〈Operation stop〉

1) Fully closed the needle valve.
2) Fully closed the primary side valve.

6-2. INSPECTION

Regularly check the oxygen concentration in the outlet nitrogen gas with an oxygen concentration meter.

If the predetermined concentration has not been obtained, please check the following items are predetermined values.

- Compressed air pressure
- Compressed air temperature
- Outlet nitrogen gas flow rate
- Outlet nitrogen gas pressure

The oxygen concentration in the outlet nitrogen gas change by compressed air pressure, temperature and outlet nitrogen gas flow rate.

Always measure under certain conditions.

7. MAINTENANCE

7-1. Periodical inspection

1) Perform periodical check if drain level does not exceed max drain level.
2) Pressure differential 0.07 MPa shows life time for oil mist filter, then element to be replaced by new one.
3) Use household detergent to wash the plastic bowl.
4) Do not use anything other than household detergents

7-2. How to remove bowl

1) Shut off air, remove bowl in the following manner after confirming no air is in the bowl.
2) Rotate bowl and bowl guard counter clockwise, pushing the latch.
3) Match the matching mark of spacer and latch, then pull out bowl and bowl guard. Bowl and bowl guard can be detached at the same time.

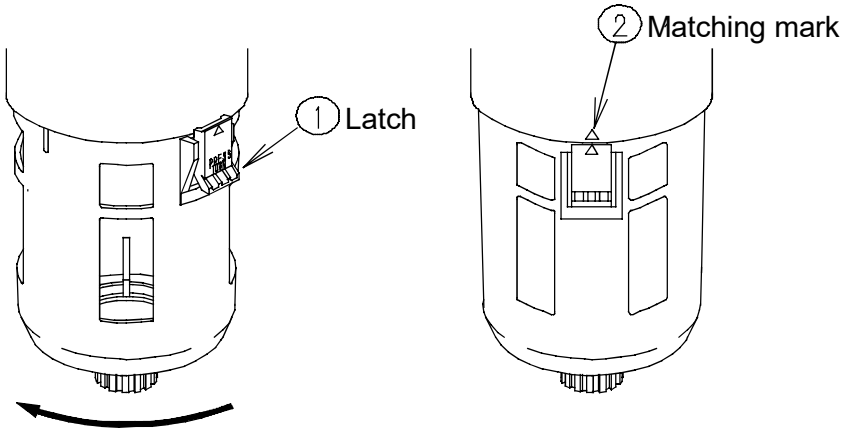


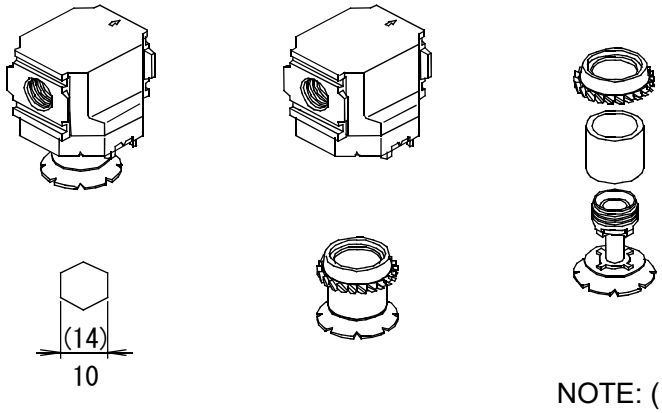
Fig.7

Follow above steps in reverse manner when assembled. Apply air after confirming latch is in the spacer recessed portion.

7-3. Element replacement

1) Air filter

Remove buffle by which element is fixed, after removing bowl. Use hex key wrench as buffle has hex. hole at lower part. Buffle, element and louver are removed at the same time. Follow the reverse steps when assembled. (Hex key wrench to be used…F3000: 10 mm, F4000: 14 mm)



NOTE: ( ) is for F4000.

Fig.8

2) Oil mist filter

Remove element (Mantle) which is screwed into the body, after removing bowl.

Use hex. bar spanner (Round nominated 6) for hex. hole at lower part of element (Mantle) .

Apply lithium soap base grease (Series option "FP1" selected: Food grade grease) to O-ring attached to element (Mantle) when assembled.

Hold resin cap portion when assembled to body, (Do not hold urethane foam portion)

Torque applied to element assembly is 2 N·m for F3000, M3000, M4000-W, 3 N·m for F4000.

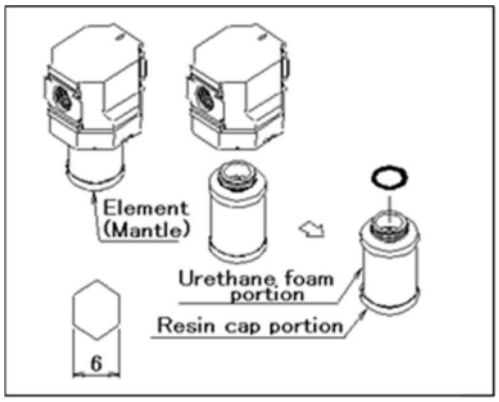


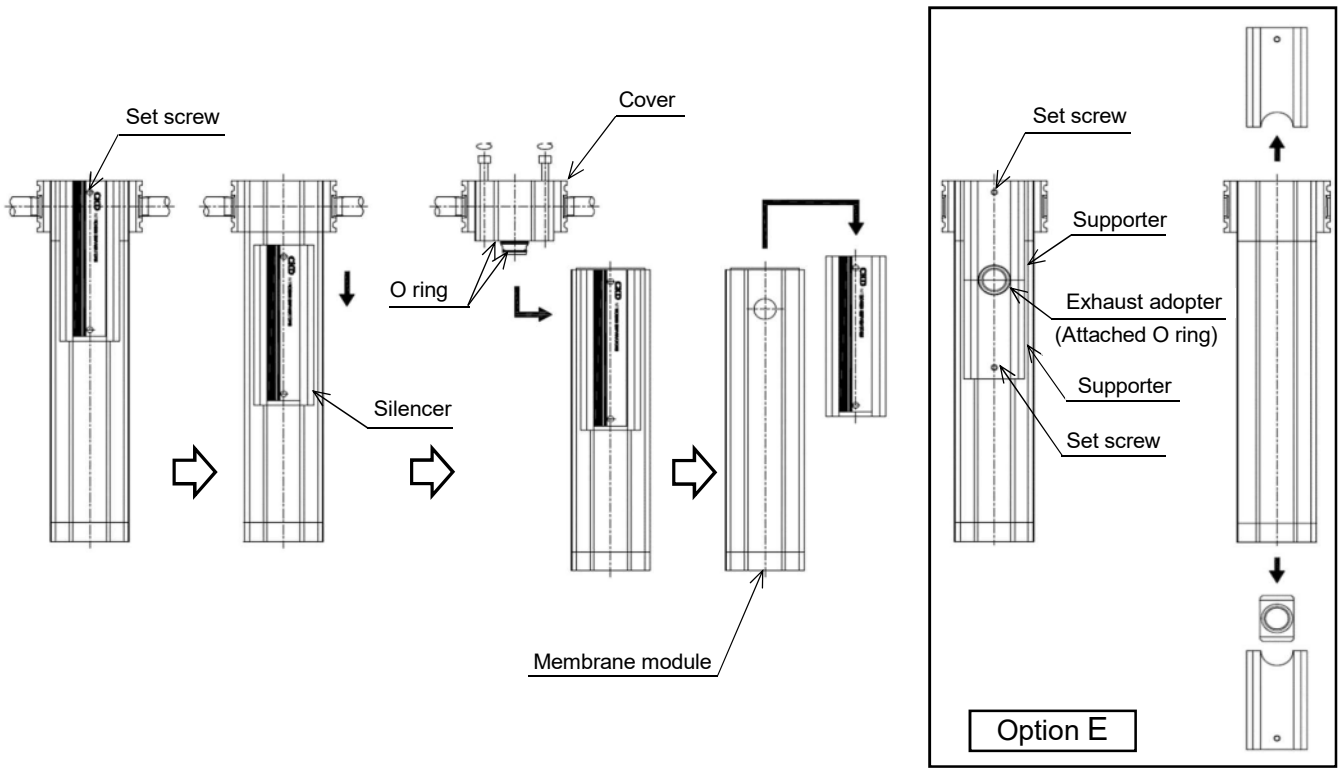
Fig.9

7-4. Membrane module replacement

■ When the mounting direction ″No sign: Vertical mounting″ is selected.

1) Slide silencer downward by loosening two set screws at silencer portion with hex key wrench. (2.5 mm) (In case of option E, shift supporter up and down, and remove exhaust adapter.)
2) Remove membrane module downward by loosening four hex socket bolts. (Upper face) with hex key wrench. (5 mm for NS-3S,3L. 6 mm for NS-4S,4L)
3) Using hex key wrench (2.5 mm) to loosen two silencer fixture screws at each membranes module assembly allows removing silencers. The silencer will be removed along the rail.
4) Do not damage membrane modules face; follow above steps in reverse manner when assembled. In case of option E since it positions so that an exhaust adapter may close purge exhaust port, fix with up-and-down supporter.
   Tightening torque is as follows:

Hex key wrench	Tightening torque
2.5 mm	3 N·m
5 mm	6 N·m
6 mm	10 N·m

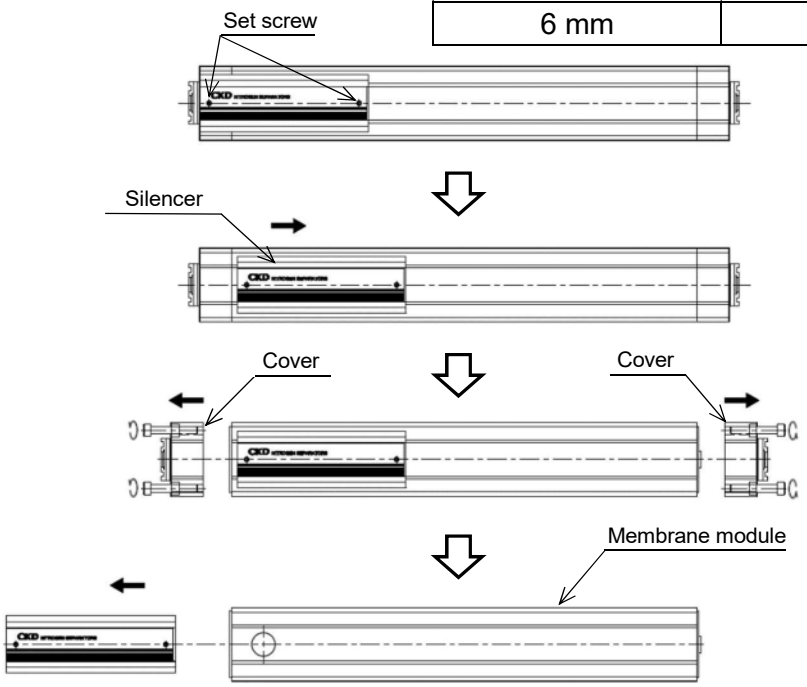


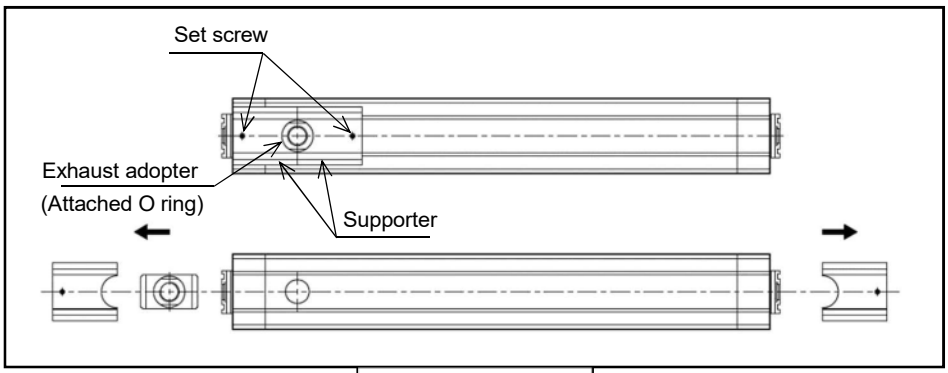
■ When the mounting direction ″T: Horizontal mounting″ is selected.

1) Slide silencer rightward by loosening two set screws at silencer portion with hex key wrench. (2.5 mm) (In case of option "D, F, E, H ", shift supporter left and right, and remove exhaust adapter.)
2) Remove membrane module by loosening each four hex socket bolts from the left and right covers with hex key wrench (6 mm).
3) Remove the silencer along the rail.
4) Do not damage membrane modules face; follow above steps in reverse manner when assembled. In case of option "D, F, E, H", since it positions so that an exhaust adapter may close purge exhaust port, fix with left-and-right supporter.

Tightening torque is as follows:

Hex key wrench	Tightening torque
2.5 mm	3N·m
6 mm	10N·m





Option D,F,E,H

8. MODEL CODING

NSU - 4 S A 10A NN - N T - FP1

- Ⓐ Body size
- Ⓑ Membrane unit size
- Ⓒ Needle valve
- Ⓓ Port size
- Ⓔ Oxygen monitor/flow rate sensor
- Ⓕ Option
- Ⓖ Mounting direction
- Ⓗ Series

Code	Description
Ⓐ Body size	
3	Body width 63
4	Body width 79
Ⓑ Membrane unit size	(*1)
S	Short
F	Short + Short
L	Long
G	Long + Short
H	Long + Long
Ⓒ Needle valve	(*2)
A	Max. flow rate 20 L/min
B	Max. flow rate 80L/min
C	Max. flow rate 160 L/min
D	Max. flow rate 240 L/min
E	Max. flow rate 400 L/min
Ⓓ Port size	
10A	Rc3/8
10B	G3/8 (*3)
10C	NPT3/8 (*4)
Ⓔ Oxygen monitor/flow rate sensor	(*5)
NN	No
AK	With oxygen monitor
AM	With oxygen monitor, traceability cert with series variation diag and company cert
BA	With flow rate sensor (20 L/min specification)
BB	With flow rate sensor (50 L/min specification)
BC	With flow rate sensor (100 L/min specification)
BD	With flow rate sensor (200 L/min specification)
BE	With flow rate sensor (500 L/min specification)
CA	With oxygen monitor and flow rate sensor (20 L/min specification)
CB	With oxygen monitor and flow rate sensor (50 L/min specification)
CC	With oxygen monitor and flow rate sensor (100 L/min specification)
CD	With oxygen monitor and flow rate sensor (200 L/min specification)
CE	With oxygen monitor and flow rate sensor (500 L/min specification)
CF	With oxygen monitor (with traceability) and flow rate sensor (20 L/min specification)
CG	With oxygen monitor (with traceability) and flow rate sensor (50 L/min specification)
CH	With oxygen monitor (with traceability) and flow rate sensor (100 L/min specification)
CJ	With oxygen monitor (with traceability) and flow rate sensor (200 L/min specification)
CK	With oxygen monitor (with traceability) and flow rate sensor (500 L/min specification)
Ⓕ Option	
N	No option
E	With exhaust port (*6)
K	Flow rate sensor With unit switching function (overseas models only)
P	Flow rate sensor Switch output: PNP output
X	Reverse flow (*7)
Ⓖ Mounting direction	
Blank	Vertical mounting
T	Horizontal mounting (available with NSU-4S, 4L)
Ⓗ Series	
Blank	Standard
FP1	Series for food processing

* Contact CKD for other combinations.

*The oxygen sensor does not include connector cables. 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

● AC adapter single unit

PNA-A

● AC adapter + conversion plug set

PNA-AG

Refer to page 16 for dimensions.

⚠ Precautions for model No. selection

*1: Only the body size "4" is available for the membrane unit sizes "F", "G" and "H".

*2: Refer to the table below for combinations of Ⓒ needle valve. Select a flow rate sensor with a suitable range for the needle valve.

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

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

*4: When selecting NPT3/8, the regulator pressure gauge units will be shown as psi.

*5: Switch output for the flow rate sensor is NPN. Specify the option "P" to obtain PNP output.

*6: Exhaust air (oxygen-enriched gas) from standard products is released into the atmosphere. For "E", piping connection for exhaust (oxygen-rich gas) is possible. Size of exhaust port is Rc1/2.

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

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