



Exhaust Gas Washing Equipment for Fume Hoods (Dry Type)


**GAS ABSORBING
EQUIPMENT**

CRF3

Instruction Manual

First Edition

- Thank you for purchasing Yamato's Exhaust Gas Washing Equipment.
- In order ensure correct use of this product, be sure to read this operation manual and warranty card before use. After reading, keep the manual together with the warranty card within reach carefully.

 **Warning:** Read and understand thoroughly warnings in this manual before use.

**Yamato Scientific America Inc.
Santa Clara, CA**

Printed on recycled paper

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About Symbol Mark

Various symbol marks are provided in this manual and on the product to ensure safety. The results incurred from wrong handling of the product without understanding of the meaning of these symbols are classified as follows.

Please understand the meaning before reading the text.



Warning

Indicates the content that may possibly result in death or heavy injury (Note 1).



Caution

Indicates the content that may possibly result in minor injury (Note 2) or physical damage (Note 3).

(Note 1) Heavy injury includes aftereffects such as injury, electric shock, bone fracture, poisoning and injuries requiring hospitalization or long-term hospital visit for treatment.

(Note 2) Minor injury includes injury or electric shock that does not require hospitalization or long-term hospital visit for treatment.

(Note 3) Physical damage includes damages regarding properties such as facilities and equipment, and buildings.

Meaning of symbol mark



This indicates matters prompting warning (including caution).
Specific warning content is indicated near the mark.



This indicates prohibition.
Specific prohibition content is indicated near the mark.



This indicates the matter that must always be made.
Specific instruction content is indicated near the mark

1. Safety Precautions

List of symbol marks

Warning



Warning in general



High voltage



High temperature



Drive



Explosion

Caution



Caution in general



Electric shock



Burn



Empty burning



Water leakage



Dedicated to water



Poisonous
substance

Prohibition



Prohibition in
general



No fire



No disassembling



No contact

Enforcement



Enforcement
in general



Earth wire
connection



Horizontal
installation



Unplugging



Regular check

1. Safety Precautions

Warnings and Cautions

Warnings



Do not use in inflammable or explosive gas atmosphere.

Never use the product in the inflammable or explosive atmosphere.
This product is not of an explosion proof type and may cause fire or explosion.



Do not disassemble or modify the unit.

Never disassemble or modify the unit. A fire or an electrical shock may result.



Prohibition of storage of chemicals in the frame.

When acids, alkaline, or organic solvents are stored in the frame, evaporation of chemicals may cause corrosion to the frame proper or piping, electric parts. Explosion may also occur due to reaction of chemicals.



Pay attention to electric shock of the joint box within the frame.

Never attempt to touch the joint box within the frame, to which box a power supply for time accumulation is connected. Otherwise, an electric shock may result.



Do not use the product in the experiment with perchloric acids.

The use of perchloric acids causes erosion of the exterior and interior of the main body, resulting in explosion.



Do not perform experiment when the exhaust blower is stopped.

When the exhaust blower is stopped due to failure of the motor or power failure, stop the experiment immediately, turn OFF the main power supply, and escape to a safe place with clean air.



Do not use any radioactive material.

This machine is not designed to handle radioactive materials. Do not use any radioactive materials.



Do not use any organisms.

Do not use any organisms because this product is not designed for organisms (particularly, pathogenic ones).

1. Safety Precautions

Warnings and Cautions



Cautions



When it begins to thunder

When it begins to thunder, turn OFF power supply immediately. Otherwise, fire or electric shock may occur.



Prepare the extinguisher.

Prepare the extinguisher near the draft chamber for use in case of fire.



Pay attention to use of heat source.

The standard grade K adsorbent equipped in the adsorption tower is active charcoal, which achieves maximum performance at gas temperature less than 40°C. Take enough care so that the gas temperature will not rise to 40°C or more to prevent significant performance degradation when using a heat source.



Never forget to wash the pre-filter.

When the differential pressure gauge shows 15~20mmH₂O, which indicates clogging of the pre-filter, be sure to wash it with water or air.



Adsorbent change timing

Change adsorbent when the timer reading has exceeded the specified value. For calculation of the required time, refer to "Adsorbent Life Calculation Method." on page 13.



Main body

The exterior surface of the main body is provided with chemical-resistant baking finish. Any damage to the coating may cause break-away of coating, resulting in corrosion.



Prevention of exhaust gas back flow

After work, continue exhausting operation for a while (about 10 minutes) to prevent back flow of remaining exhaust gas.



Selection of adsorbent according to the target gas

The standard adsorbent equipped in the adsorption tower is for neutral gases. Select adsorbent for deacidification gas or for abasic gas appropriate for the specific application.



Do not use at high temperature

The operating temperature of this machine is 5°C to 35°C. Keep the ambient temperature of the location within a range of 5°C to 35°C.

2. Before Use

Installation Method and Preparation

Warnings

1. Select the installation place carefully.



● Do not install the product in following places:

- Irregular or contaminated floor surface
- Place with inflammable or corrosive gas
- Highly humid place
- Place with excessive temperature difference
- Place where the ambient temperature is 35°C or more
- Place with excessive vibration

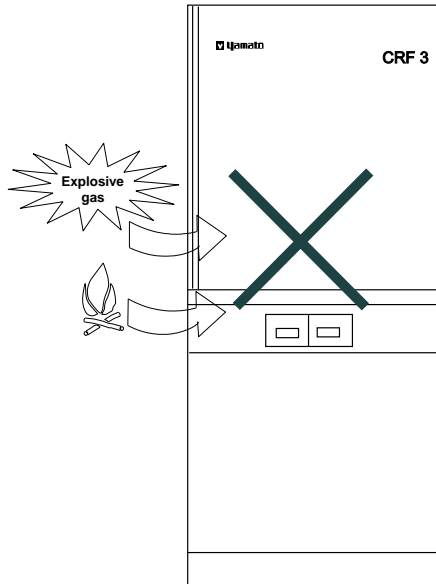
2. Never use the product in an inflammable or explosive gas atmosphere



● **Never use the product in an inflammable or explosive gas atmosphere. This is not of an explosion proof, and arc may be generated when the switch is turned ON or OFF or during operation, causing fire or explosion.**



● **For inflammable and explosive gases, refer to P. 24, List of Hazardous Substances.**



2. Before Use

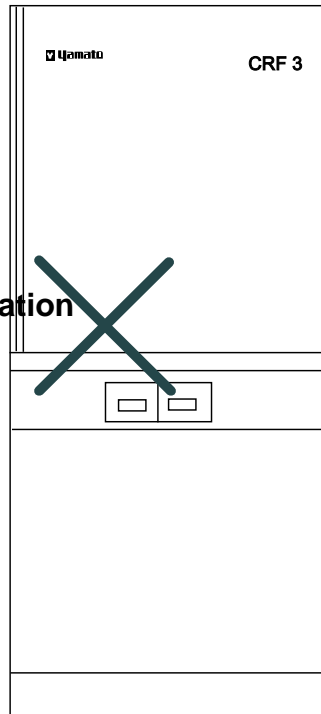
Installation Method and Preparation

3. Never attempt modification.



- Unauthorized modification may cause failure. The customer is requested never to attempt modification

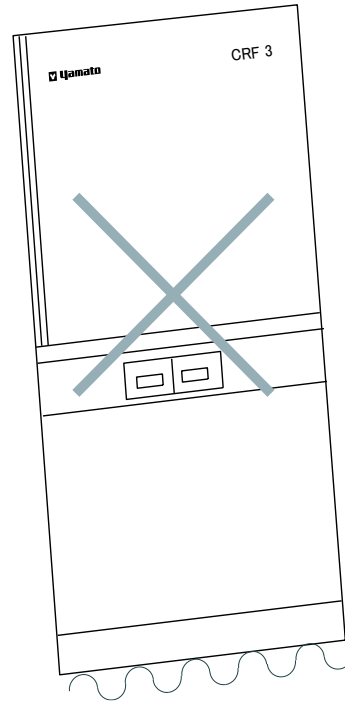
No modification



4. Install on the horizontal place.



- Install the product in a level place as much as possible. Otherwise, an unexpected trouble or failure may occur.



5. Installation



- The product may overturn, causing injury, in case of an unexpected earthquake or impact. It is recommended to take a safety measure, such as avoidance of a busy place, etc.

2. Before Use

Installation Method

This product consists of three components: the frame, the upper bed (adsorption tower assembly), and accessory (corrugate box). Carry out the installation as described below.

- ① First, set the frame in a specified position. If the location is not convenient for placement of the upper bed, set the frame in the forward position beforehand and place the upper bed on it, then move the frame to the specified position.



Caution

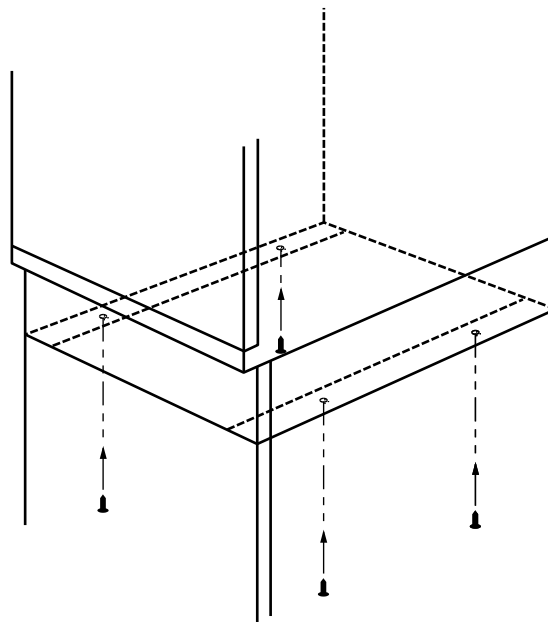
The operation temperature range of the product is 5~35°C. Set the atmospheric temperature of the location to 5~35°C.

- ② Then place the upper bed on the frame. After having stacked them, fix the upper bed and the frame with the attached bolts.



Caution

- Five or more workers must be engaged when lifting the upper bed.
- When lifting the upper bed, ensure equal lifting of each position.



Warning

At the time of shipping, parts filters (adsorbent) have been installed in the adsorption tower, one filter weighs about 2.5kg and the upper bed weight is considerably heavy. If the assembly is too heavy to allow easy transportation and installation, remove the parts filters out of the inspection port and replace them after installation. In this case, be sure to put on rubber gloves and protect the temporary storage site for the parts filters with a vinyl sheet.



Warning

Request connection of piping and wiring to our office or the shop from which you have purchased the product or to the equipment work contractor. Expertise and professional technique are necessary for connection of piping and wiring. If the worker without these requirements performs connection, water or gas leakage, electric shock, or fire may occur.

Duct connection work

The diameter of ducts differs depending on the specific model (see “Specifications” on P.22). Use mating flanges included or equivalents for connection.



Caution

Take care not to mix up the inlet with the outlet.

Electric wiring connection work



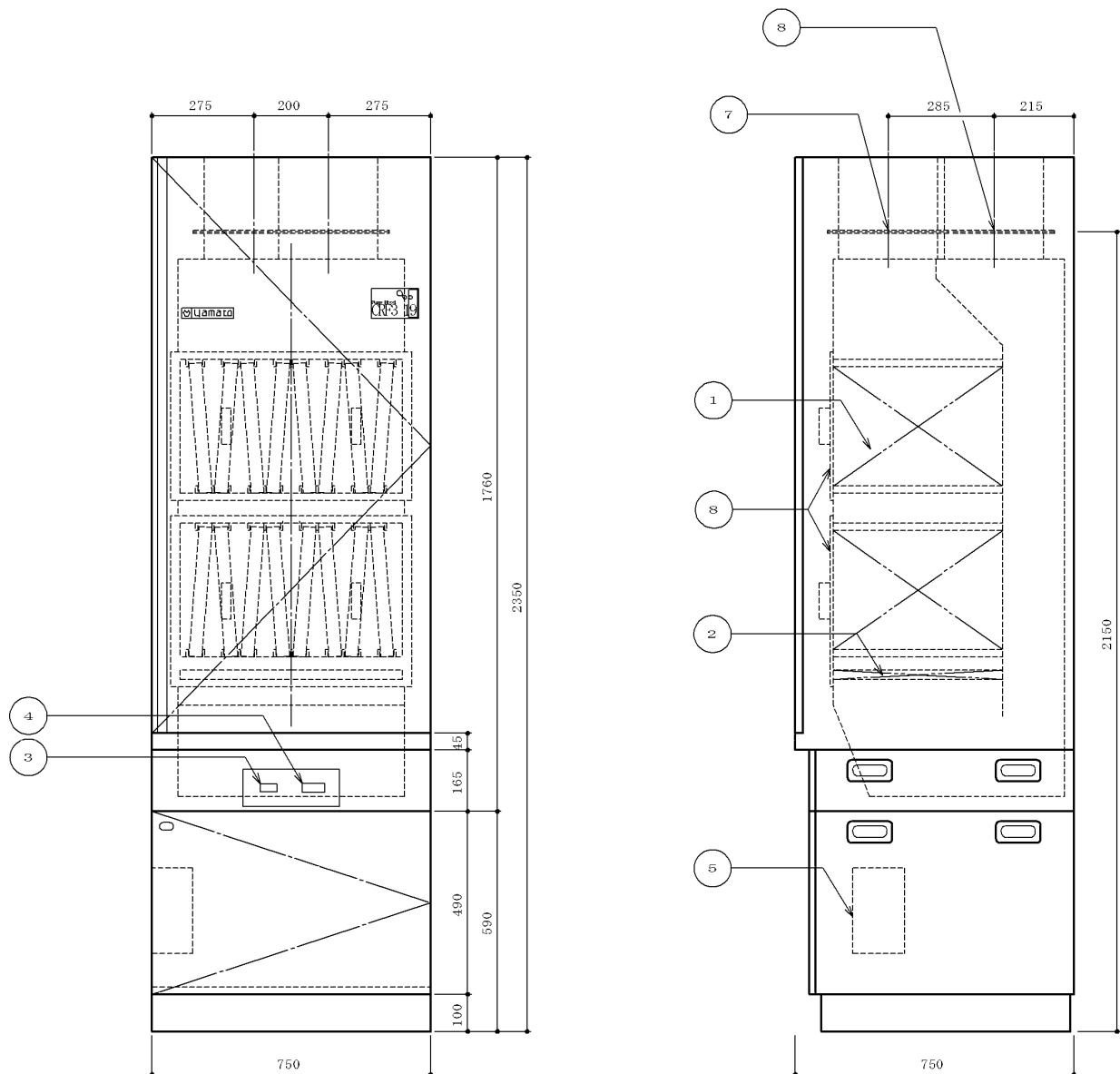
Caution

Before attempting wiring work, confirm that power supply is OFF.

- ① Connect the power for the Elapsed time indicator (with applied voltage, 2 core) from the control board of draft chamber or other devices to the terminals (1,S) in the joint box. The power supply for the Elapsed time indicator is 220V and set its circuit so that it is closed by turning the operation switch for the exhaust blower to ON and opened by turning it OFF.
- ② When connection is completed, make sure that the Elapsed time indicator is activated by turning the operation switch of the draft chamber or other units to ON and time increases on the monitor on the operation panel.

3. Name and Functions

Outline (CRF3-19)



№	Name	№	Name
1	Part filter (adsorbent)	5	Joint box (with terminal block)
2	Pre-filter	6	Inlet
3	Elapsed time indicator for adsorbent	7	Outlet
4	Pre-filter differential pressure gauge	8	Filter replacement port

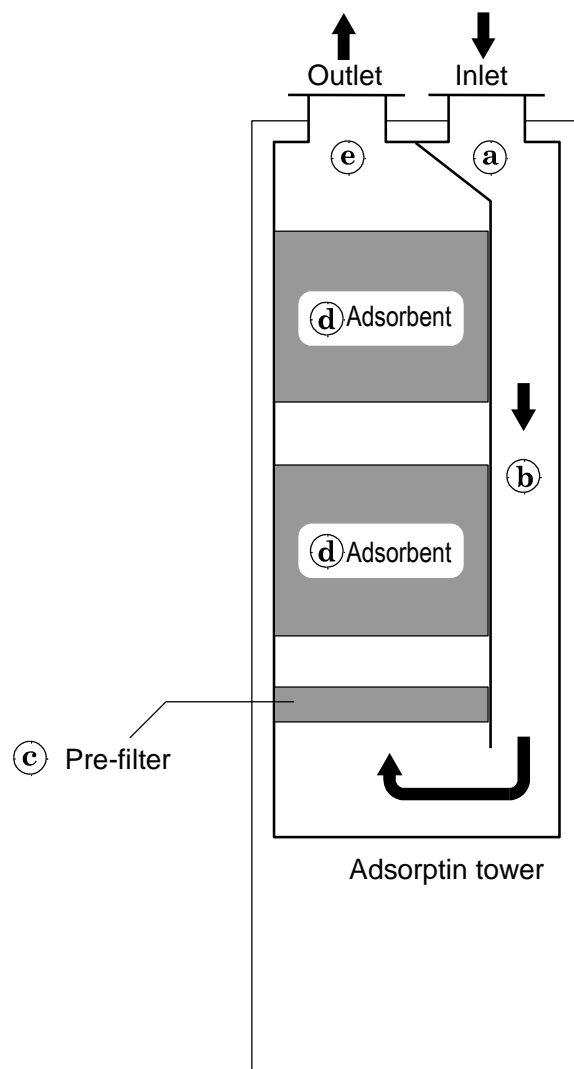
3. Name and Functions

Flow sheet

The adsorption mechanism of this exhaust gas washing equipment for fume hood works in the following steps.

<Flow of exhaust gas>

- ① Toxic gas from the draft chamber enters to the inlet (a).
- ② Toxic gas from the draft chamber flows through the duct in the adsorption tower duct (b) and then flows through the pre-filter (c). The pre-filter catches rough dusts in the gas to prevent the adsorbent from clogging.
- ③ The adsorbent phase (d) adsorbs toxic materials in the exhaust gas with activated charcoal or chemical adsorbent.
- ④ Processed exhaust gas flows through (e) and exhausted to through the connected exhaust duct.



- ① The unit does not have a switch for operation or operation circuits. Operate the exhaust blower by way of, for example, the connected draft chamber.
- ② Before starting the exhaust blower, make sure that the inspection cover is completely closed and there is no leak.
- ③ Too much exhaust wind amount will adversely affect the removing efficiency. Adjust the wind amount to an appropriate level with the exhaust damper attached to the connected draft chamber (note that the unit does not include any exhaust damper).

5. Selecting a draft chamber to connect

Possible combinations of this product and draft chambers are as shown in the table below.

Model	Exhaust wind amount (m ³ /min)	Conforming draft chamber
CRF3-12	12	RFS-120 or a local exhaust unit with the same exhaust wind amount
CRF3-19	16~19	RFS-150, 180 or a local exhaust unit with the same exhaust wind amount
CRF3-45	45	RFS-120, 150, 180 or a local exhaust unit with the wind amount that meets the organic standards (average surface wind speed 0.6m/s when door is open) or with the same exhaust wind amount.

※A special type draft chamber is needed when the RFS type (wind amount that meets the organic standards) is connected to CRF3-45.

6. Adsorbent Life Calculation Method

Activated carbon (Grade K type)

$$W_G = (W_A \times S) \times \eta \dots\dots\dots (1)$$

W_G : Allowable adsorption of gas concerned (kg)

W_A : Adsorbent weight (kg)

S : Adsorption of gas concerned (kg/kg, decrease by 20 to 30% as a safety factor)

η : Adsorption effect (0.5 for the convenience of calculation)

$$L = (W_G \times 22400) / [C \times Q \times 60 \times \{ 273 / (273 + t) \} \times M] \dots\dots\dots (2)$$

L : Life (H)

C : Concentration of the gas concerned (ppm)

Q : Processing air flow (m³/min)

t : Exhaust temperature (°C)

M : Molecular weight of the gas concerned (g/mol)

■ Calculation example

(Setting conditions)

- Type: CRF3-19L
- Name of the gas concerned: Toluene
- Adsorbent weight (W_A): 40 (kg)
- Adsorption of gas concerned (S): $0.29 \times 0.7 = 0.203$ (kg/kg)
- Molecular weight of the gas concerned (M): 92 (g/mol) Refer to page 15.
- Concentration of the gas concerned (C): 2 (ppm)
- Processing air flow (Q): 19 (m³/min)
- Exhaust temperature (t): 25 (°C)

From the equation (1)

$$\begin{aligned} W_G &= (40 \times 0.203) / 1 \\ &= 8.12 \text{ (kg)} = 8,120 \text{ (g)} \end{aligned}$$

By entering the result in the equation (2),

$$\begin{aligned} L &= (8,120 \times 22400) / [2 \times 19 \times 60 \times \{ 273 / (273 + 25) \} \times 92] \\ &= 946 \text{ (H)} \end{aligned}$$

Assuming that the draft chamber is operated for five hours a day;

$$946 \text{ (H)} \div 5 \text{ (H)} = 189 \text{ (day)}$$

Therefore, the time for replacement of activated carbon comes in 189 days.

6. Adsorbent Life Calculation Method

Chemical adsorbent (Grade A2, E2, F, O2 types)

$$M = C / V \dots\dots\dots (1)$$

M : Consumption of adsorbent (g/m³)

C : Concentration of the gas concerned (ppm)

V : Air flow to purify the gas concerned per 1 ppm (m³/g)

Gas	Purification air flow	Gas	Purification air flow	Gas	Purification air flow
Ammonia (F)	166.7	Acetaldehyde (E2)	43.5	Trimethyl amine (E2)	14.3
Nitrogen disulfide (O ₂)	88.3	Ethanol (E2)	65.6	Stylene (E2)	10.6
Sulfur dioxide (E2)	43.5	Methyl sulfide (E2)	21.3	Hydrogen sulfide (E2)	42.4
Nitrogen monoxide (E2)	42.5	Methyl mercaptan (E2)	14.3	Methyl disulfide (E2)	8.9

* (): Grade of adsorbent

$$L = (W_A \times R \times 1000) / (M \times Q \times 60) \dots\dots\dots (2)$$

L : Life (H)

W_A : Adsorbent weight (kg)

Q : Processing air flow (m³/min)

R : Coefficient (0.1 to 0.5) determined from design conditions (substance concerned, concentration, efficiency, life)

■ Calculation example

(Setting conditions)

- Type: CRF3-19L
- Name of the gas concerned: Ammonia
- Processing air flow (Q): 19 (m³/min)
- Coefficient depending on setting conditions (R): 0.3
- Purification air flow of the gas concerned (V): 166.7 (m³/g)
- Adsorbent weight: (W_A): 40 (kg)
- Concentration of the gas concerned (C): 5 (ppm)

From the equation (1)

$$\begin{aligned} M &= C / V \\ &= 5 / 166.7 \\ &= 0.03 \text{ (g/m}^3\text{)} \end{aligned}$$

By entering the result in the equation (2),

$$\begin{aligned} L &= (40 \times 0.3 \times 1000) / (0.03 \times 19 \times 60) \\ &= 350 \text{ (H)} \end{aligned}$$

Assuming that the draft chamber is operated for five hours a day;

$$350 \text{ (H)} \div 5 \text{ (H)} \doteq 70 \text{ (days)}$$

Therefore, the time for replacement of adsorbent comes in 70 days.

6. Adsorbent Life Calculation Method



Characteristics of activated carbon for various gases (adsorption retention amount of activated carbon)

* Adsorption = activated carbon retention amount (adsorption) 20°C 760 mmHg (%WT: kg/kg)

Chemical name	Chemical symbol	Molecular weight	Adsorption	Chemical name	Chemical symbol	Molecular weight	Adsorption
Acrylic acid	C ₃ H ₄ O ₂	72.1	20%	Methyl acetate	C ₃ H ₄ O ₂	74.1	16
Acrolein	C ₃ H ₄ O	56.1	15	Sulfur trioxide (sulfuric anhydride)	SO ₃	80	dry15
Acetylene	C ₂ H ₂	26.0	2	Diethyl ketone	C ₃ H ₁₀ O	86.1	30
Acetaldehyde	CH ₃ CHO	44	7	Carbon tetrachloride	CCl ₄	154	45
Acetone	C ₃ H ₆ O	58.0	15	Dichloromethane	CH ₂ Cl ₂	84.9	25
Amyl alcohol	C ₅ H ₁₂ O	88.2	35	Hydrogen bromide	HBr	80.9	12
Sulfur dioxide	SO ₂	64.0	dry10	Nitric acid	HNO ₃	63	20
Ammonia	NH ₃	17.0	Fewness	Bromine	Br ₂	160	40
Isopropyl alcohol	C ₃ H ₈ O	60.0	26	Skatole	C ₉ H ₉ N	131	25
Isopropyl ether	C ₆ H ₁₄ O	102	18	Hydrogen fluoride	HF	20	10
Indole	C ₈ H ₇ N	117	25	Butyl alcohol	C ₄ H ₁₀ O	74.1	30
Ethyl alcohol	C ₂ H ₆ O	46.1	21	Butylaldehyde	C ₄ H ₈ O	72.1	20
Ethyl ether	C ₄ H ₁₀ O	74.1	15	Butyl ether	C ₅ H ₁₂ O	88.1	20
Ethylene	C ₂ H ₄	28.1	3	Decane	C ₁₀ H ₂₂	142	25
Isopropyl chloride	C ₃ H ₇ Cl	78.5	20	Toluene	C ₇ H ₈	92	29
Ethyl chloride	C ₂ H ₅ Cl	64.5	12	Nitrogen dioxide	NO ₂	46	10
Butyl chloride	C ₄ H ₉ Cl	92.6	25	Nicotine	C ₁₀ H ₁₄ N ₂	162	20
Methyl chloride	CH ₃ Cl	50.5	5	Nitrobenzene	C ₆ H ₅ NO ₂	123	20
Chlorine	Cl ₂	71.0	15	Lactic acid	C ₃ H ₆ O ₃	90	30
Octane	C ₈ H ₁₈	114	25	Carbon dioxide	CO ₂	44	15
Ozone	O ₃	48	Decomposed	Carbon disulfide	CS ₂	76.1	15
Caprylic acid	C ₈ H ₁₆ O ₂	144	35	Nonyl hydride	C ₉ H ₂₀	128	25
Formic acid	CH ₂ O ₂	46	7	Palmitic acid	C ₁₆ H ₃₂ O ₂	256	35
Xylene	C ₈ H ₁₀	106	34	Viridin	C ₁₉ H ₁₆ O ₆	340	25
Valeric acid	C ₅ H ₁₀ O ₂	102	35	Propionic acid	C ₃ H ₆ O ₂	74.1	40
Cresol	C ₇ H ₈ O	108	30	Propyl mercaptan	C ₃ H ₆ S	76.2	25
Crotonaldehyde	C ₄ H ₆ O	70.1	30	Benzene	C ₆ H ₆	78.1	24
Chloroform	CHCl ₃	119	40	Menthol	C ₁₀ H ₂₀ O	156	20
Acetic acid	C ₂ H ₄ O ₂	60	40	Iodine	I ₂	254	40
Amyl acetate	C ₇ H ₁₄ O ₂	130	34	Butyric acid	C ₄ H ₈ O ₂	88.1	40
Ethyl acetate	C ₄ H ₈ O ₂	88.1	19	Hydrogen sulfide	H ₂ S	34	dry3
Butyl acetate	C ₆ H ₁₂ O ₂	116	28	Sulfuric acid	H ₂ SO ₄	98	30

7. Cautions for Operation

Cautions for Operation

 Danger	<ul style="list-style-type: none">• Do not use the product for organisms (particularly, pathogenic ones). The experiment using organisms must be made in a dedicated facility.• Do not use the radioactive substances. The experiment using radioactive substances must be made in a dedicated facility.
 Warning	<ul style="list-style-type: none">• Never use the product in an inflammable or explosive gas atmosphere. This is not of an explosion proof, and arc may be generated when the switch is turned ON or OFF or during operation, causing fire or explosion.

- The V type adsorbing tower is made of hard vinyl chloride. Always keep the inlet gas temperature at 50°C or less. The grade K type adsorbent is activated charcoal, whose performance may significantly degrade at 40°C or more. Take enough care when using a heat source.
- Do not store anything that may generate corrosive or flammable gas in the frame.

Maintenance Work

Maintenance of adsorbent

- ① Adsorbent needs to be replaced when the elapsed time indicator on the operation panel indicates the end of adsorbent life. For calculation of use life of adsorbent, see “6. Adsorbent Life Calculation Method” on P.13 and after.
- ② Open the door of the upper bed and loosen the knob (L type) or the PVC bolt (V type) to remove the inspection cover on the internal adsorption tower.
- ③ After removing the cover, pull out part filters one by one by pulling them toward you to replace them with new ones. (Grade K type adsorbent may be regenerated depending on chemical adsorbed. Contact us.)
- ④ Replace the packing for sealing the inspection cover if it is corroded.
- ⑤ Used part filters are classified as industrial wastes and may not be disposed as general wastes. Ask their disposal to us or a professional company.

Pre-filter maintenance

- ① When the differential pressure gauge shows 15~20 mmH₂O, which indicates clogging of the pre-filter, its maintenance is necessary.
- ② Open the door of the upper bed and loosen the knob (L type) or the PVC bolt (V type) to remove.
- ③ After removing the cover, pull out the pre-filter toward you, remove the filter off the frame and wash with water and/or air. When the filter is regenerated, set it again in the frame. When the filter is severely soiled with, for example, chemicals, replace it with a new one.
- ④ Replace the packing for sealing the inspection cover if it is corroded.



Warning

- **Take extreme care for possible electric shock with the joint box.**

Since the elapsed time indicator is connected in the joint box, take special care for electric shock.

- **Never attempt to modify the joint box.**

Modification of parts or wiring in the joint box may cause a malfunction or a fire.

Recovery from power failure

In case of power feed after stop due to power failure during operation, this product is reset to the initial condition. Immediately stop the peripheral equipment, stop experiment, and check the equipment.

Pay due attention in this case because the gas not fully discharged may flow back, presenting extremely dangerous condition.

8. Servicing Method

Daily Check and Servicing



Caution

Main body

- Wipe off contamination from the surface with a well-squeezed soft cloth. Do not splash water directly. To avoid damage to coating and rusting, never wipe the body with benzine, thinner and cleanser or rub with brush. Otherwise, electric shock may occur.

◆ If you have questions, immediately contact your dealer or one of Yamato sales offices.

9. Before Long-term Shutdown or Discarding



Warning

For long-term shutdown

- Turn OFF power supply and disconnect the cord.



Cautions

For discarding

- Do not leave the product in a place where children play.
- Remove all of drives.
- Normally, the product must be treated as large refuse.

Considerations for Discarding

Pay attention to conservation of the global environment.

When discarding, it is recommended to disassemble as much as possible for separated discarding or recycle so as to conserve the environment. Principal components and materials used in this product are as follows.

Names of major parts	Material
Major components of the main body	
Exterior	Steel plate, melamine/epoxy synthesized resin paint
Adsorption tower	CRF3-□□L : Stainless steel plate SUS304 CRF3-□□V : Hard vinyl chloride
Adsorbent	Activated carbon (K), chemical adsorbent (A2, E2, F, O2)
Electrical system major components	
Wiring materials	Glass fiber, fire retardant vinyl, copper, nickel and other composite items
Seals	Resin material

10. In Case of Trouble

Troubleshooting Guide

Symptom	Cause	Countermeasure
Toxic gas cannot be removed	The grade of adsorbent being used is not appropriate for toxic gas to remove.	Replace with adsorbent of a grade appropriate for toxic gas to remove.
	Processing wind amount exceeds the setting.	Adjust the setting using the exhaust damper of the draft chamber connected.
	Adsorbent has reached its life time	Replace the adsorbent.
Elapsed time indicator does not work.	Elapsed time indicator is not connected to the draft chamber or other units.	Reconnect wires referring to "Installation" on pages 7 and after.
	Malfunction of the elapsed time indicator.	Replace the elapsed time indicator.
Elapsed time indicator does not work or stops at the indication of "0".	The tube between the adsorption tower and the differential pressure gauge is clogged with dusts or other foreign materials.	Remove dusts from the tube. Or replace it.
	The tube is disconnected.	Reconnect the tube.
	Malfunction of the differential pressure gauge.	Replace the differential pressure gauge.
Wind roar is heard from the adsorption tower.	The sound is leaking since the inspection cover is not completely closed.	Retighten the knob (L type) or the PVC bolt (V type) on the inspection cover to V to stop leak. ※Take care not to tighten the knob and the PVC bolt too tight.

In case of power failure

In case of power feed after stop due to power failure during operation, this product is reset to the initial condition.

Immediately stop the peripheral equipment, stop experiment, and check the equipment.

Pay due attention in this case because the gas not fully discharged may flow back, presenting extremely dangerous condition.

11. After-sale Service and Guarantee

When requesting the repair

When requesting the repair

Should any abnormality occur, stop operation immediately, turn OFF the power switch, and disconnect the power plug (cord). Then, contact the shop from which you have purchased the product or Yamato office.

Necessary data

- Product type name
 - Manufacture No
 - Year/month/day of purchase
 - Details of failure (as detailed as possible)
- } Refer to the nameplate provided in the guarantee card or to the machine.

Be sure to present the guarantee card when our service representative visits the customer.

Guarantee card (attached separately)

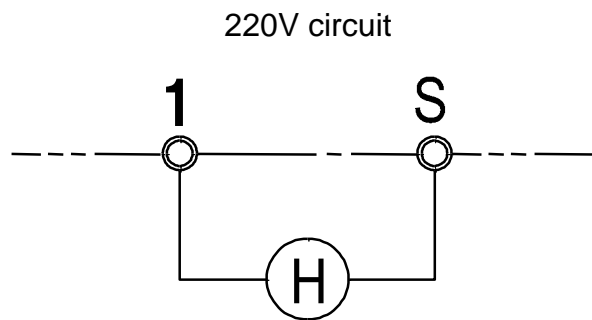
- The guarantee card will be presented from the shop from which you have purchased the product or from the Yamato office. Check if the name of the shop and date of purchase are in the card and keep it in custody with care.
- The guarantee period is one year from the date of purchase. Free repair service will be provided according to the description of the guarantee card.
- For the repair after expiration of the guarantee period, consult the shop or our office. If the function can be maintained by repair, we will provide repair service at cost if so requested by the customer.

12. Specifications

Model	CRF3-12	CRF3-19	CRF3-45
External dimension W×D×H (mm)	650×750×2350	750×750×2350	1050×750×2350
External finish	Cold rolled plate (SPCC) Chemical proof baking finish Color: main body ; White (Munsell N9.02 approximate)		
Adsorption tower	CRF3-□□-L : Stainless steel plate (SUS304) CRF3-□□-V : Hard vinyl chloride		
Adsorbent (grade)	Activated charcoal (K) chemical adsorbent (A2,E2,F,O2)		
Inlet duct (mm)	L type	SUS—304φ250	SUS-304 350×250
	V type	PVC I.D. φ261mm; O.D.φ267mm	PVC 350×250
Outlet duct (mm)	L type	SUS—304φ250	SUS-304 350×250
	V type	PVC I.D. φ261mm; O.D.φ267mm	PVC 350×250
Processing wind amt. (m ³ /min)	12	16~19	28~45
Internal pressure loss (Pa/mmH ₂ O)*	294/30	294~343/30~35	294~490/30~50
Equipment	<ul style="list-style-type: none"> Differential pressure gauge (0~50 mmH₂O) Elapsed time indicator (0~9999.9H) Joint box (with terminal block) <p style="text-align: right;">x1 each</p>		
Accessories	<ul style="list-style-type: none"> Operation manual, retouching paint <p style="text-align: right;">x1 each</p>		
Main unit weight(kg)	180	240	350

※ Internal pressure loss has been calculated at the final pre-filter pressure loss of 15 mmH₂O/147Pa.

13. Connection Diagram



Symbol	Part name
H	Elapsed time indicator

14. List of Hazardous Substances



Pay due attention when using explosive and inflammable substances and substances containing these ones.

Explosive substances	Explosive substances	(1) Nitroglycol, nitroglycerine, nitrocellulose, other explosive nitrate ester
		(2) Trinitrobenzen, trinitrotoluene, picric acid, and other explosive nitro compounds
		(3) Peracetic acid, methyl ethyl ketone peroxide, benzoyl peroxide, other organic peroxides
Inflam-mable substances	Ignitable substances	Metal lithium, metal potassium, metal sodium, yellow phosphorous, phosphorous sulfide, red phosphorous, celluloid, calcium carbide (carbide), lime phosphide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powders, sodium dithionite (hydrosulfite)
	Oxidizing substances	(1) Potassium chlorate, sodium chlorate, ammonium chlorate, other chlorates
		(2) Potassium perchlorate, sodium perchlorate, ammonium perchlorate, other perchlorates
		(3) Potassium peroxide, sodium peroxide, barium peroxide, other inorganic peroxides
		(4) Potassium nitrate, sodium nitrate, ammonium nitrate, other nitrates
		(5) Sodium chlorite, other chlorites
		(6) Potassium hypochlorite, other hypochlorites
	Inflam-mable substances	(1) Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon bisulfide, other substances whose flash point is less than 30°C below zero.
		(2) Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone, other substances whose flash point is 30°C or more below zero, but less than 0°C
		(3) Methanol, ethanol, xylene, pentyl acetate (amyl acetate), other substances whose flash point is 0°C or more, but less than 30°C.
		(4) Kerosene, diesel oil, turpentine, isopentyl alcohol (isoamyl alcohol), acetic acid, other substances whose flash point is 30°C or more, but less than 65°C
	Combus-tible gases	Hydrogen, acetylene, ethylene, methane, ethane, propane, butane, other substances that are combustible and gaseous at a temperature of 15°C and 1 atmospheric pressure

(Excerpt from Table 1 of Clause 6, Cabinet Order on the Occupational Safety and Health Law

Scope of Responsibility

Be sure to observe the operation method described in this manual when using the product

In case of accident or failure because the product is used according to the method other than described in the manual, Yamato will not bear any responsibility.

Never attempt prohibitions in this manual. Otherwise, unexpected accident or failure may occur.

Notice

- The content of the manual may be changed without notice in the future.
- A manual with a missing page or paging disorder will be exchanged.

Instruction Manual

Exhaust Gas Washing Equipment for Fume Hoods (Dry Type)

CRF3

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