

- After approximately 25, 50, 75, and 100% of the formalin has been evaporated, turn on the cabinet blower for 1 minute to circulate the formalin throughout the cabinet. Below is the approximate time interval to turn on the blower, corresponding to the formalin and ammonia table for the “worse case scenario” as previously discussed:

Cabinet Width	2ft / 0.6m	3ft / 0.9m	4ft / 1.2m	5ft / 1.5m	6ft / 1.8m
Volume (m ³)	1	1.5	2	2.5	3
Blower ON interval	5 min	7.5 min	10 min	12.5 min	15 min

- Allow the formalin vapor a minimum contact time of 8 hours inside the cabinet, preferably 10 hours, but overnight is better (CONTACT TIME).
- The ammonia vaporizer will automatically start after the “CONTACT TIME” is finished. If possible, it’s desirable to circulate the ammonia by turning on the cabinet blower at the same interval as the formalin vaporization. However, this is not required, and not as important as circulating the formalin.
- Allow the ammonia vapor a minimum neutralization time of 2 hours inside the cabinet (NEUTRAL TIME)
- After the “NEUTRAL TIME” is finished the time will inform the user to open the plastic bag. Please be aware that the formalin and / or ammonia concentration inside the plastic bag may be above the Short Term Exposure Level (STEL) and full face mask with formalin filter is required when opening the plastic bag.

By pressing MENU button after the decontamination process is started, the decontamination / neutralization cycle is interrupted, the following menu options are then displayed.

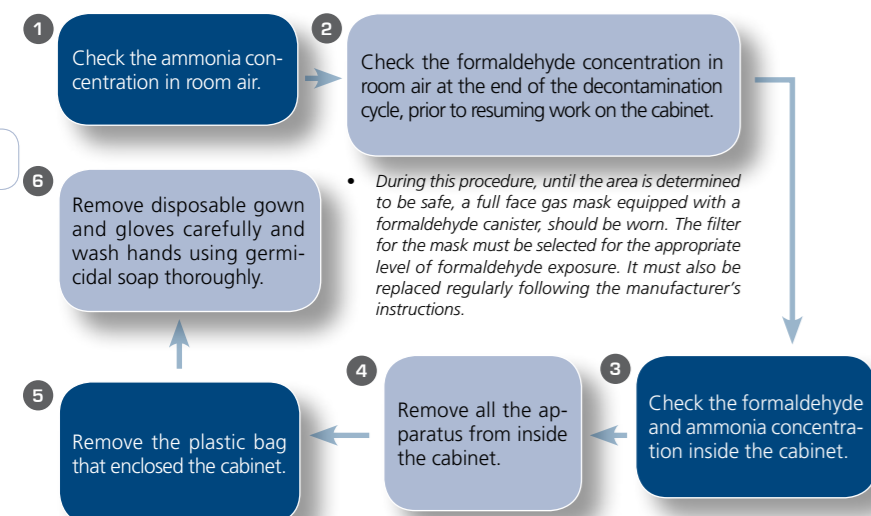
RESUME STEP: This option allows the user to continue with the decontamination process

SKIP STEP: This option allows the user to move to the next stage in the decontamination process

CANCEL PROCESS: In case of emergency, the user can cancel the decontamination process by choosing this option.



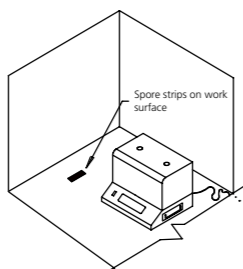
Completion Steps



1. Before the filters are removed from the cabinet, their contaminated faces should be taped off using plastic film or cardboard or some other suitable material. This will minimize the risk of personnel in the event the decontamination was not thorough.
2. Used filters should be disposed following local regulations. They may have to be incinerated as medical waste. They should be double bagged and appropriately labeled following removal from the cabinet

Validation Of Decontamination Procedure (Optional)

- Place some Bacillus subtilis var.niger spore strips inside the cabinet prior to decontamination.
 - * work surface/table tray
 - * drain pan
 - * downstream HEPA filter
- Place similar strips outside the decontamination room for positive control (optional).



- Remove all the spore strips and place in Trypticase-soy broth and incubate for 2 days at 37°C.
- If there is no growth of bacteria inside the broth (the broth remains clear), the decontamination procedure has been successfully verified.



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Since 1978, Esco has emerged as a leader in the development of controlled environment, laboratory and cleanroom equipment solutions. Products sold in more than 100 countries include biological safety cabinets, cleanroom products, compounding pharmacy equipment, containment / pharma products, ductless fume hoods, in vitro fertilization workstations, lab animal research products, laboratory fume hoods, laboratory ovens and incubators, laminar flow clean benches and PCR products and instrumentation. With the most extensive product line in the industry, Esco has passed more tests, in more languages, for more certifications, throughout more countries than any biosafety cabinet manufacturer in the world. Esco remains dedicated to delivering innovative solutions for the clinical, life science, research and industrial laboratory community. www.escoglobal.com.

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Esco Technologies, Inc. • 2940 Turnpike Drive, Units 15-16 • Hatboro, PA 19040 USA
Toll-Free USA and Canada 877-479-3726 • Tel +1 215 441 9661 • Fax +1 215 441 9660
us.escoglobal.com • usa@escoglobal.com

Esco Micro Pte. Ltd. • 21 Changi South Street 1 • Singapore 486 777
Tel +65 6542 0833 • Fax +65 6542 6920 • mail@escoglobal.com
www.escoglobal.com

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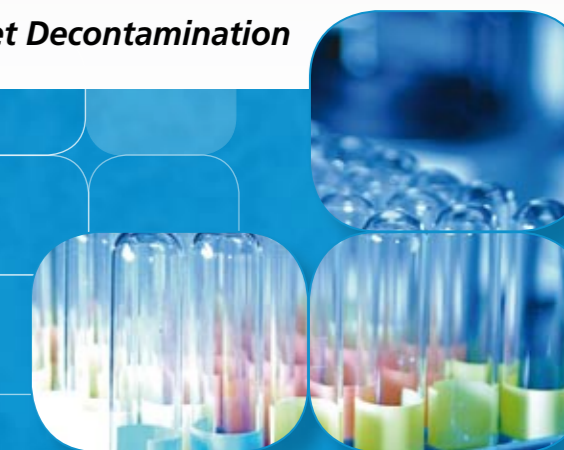
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Esco Formalin Vaporizer Model FV-00_

Formalin Vaporizer

The Premium Solution for Biological Safety Cabinet Decontamination



Standards Compliance

- The unit enables decontamination to be accomplished by the standard protocol as recommended in EN 12469 (European standard for microbiological safety cabinets) with formalin and ammonia solutions.
- ANSI / NSF49 (American standard for Class II cabinets) recommends decontamination using paraformaldehyde and ammonium bicarbonate which is a similar protocol but with agents in the solid (instead of liquid) state, and as such this vaporizer can also be said to be in compliance with the ANSI / NSF49 recommended decontamination protocol.

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Esco Experience

As a global leader in premium quality biological safety cabinets, Esco is committed to providing it's customers with a full range of innovative ancillary products to compliment its extensive range of cabinets.

The Esco formalin vaporizer is a microprocessor-controlled unit that simplifies and automates the decontamination process for all sizes and makes of biological safety cabinets. This also increases safety for the decontamination operator and laboratory personnel since no manual intervention is required during the entire process.

Dependable Construction

- Durable, heavy-duty full stainless steel construction.
- Electrical and electronic components are isolated from the heating chamber to prevent exposure to chemical fumes and heat which can reduce component life.
- Thermostats for the formalin and ammonia chambers prevent overheating.
- Backup thermostat ensures the temperature of the external casing does not rise above a safe level.
- Internal heat insulation prevents cross heating of chambers and damage to electrical components.
- Manual shut-off isolating switch and safety circuit breaker.

Innovative Design

- Full-sized grip handles on both sides for easy handling.
- Large formalin and ammonia chambers (800 ml maximum capacity each) allow even the largest biological safety cabinets (6 foot console / floor-mounted units) to be decontaminated with the maximum agent volume recommended in EN 12469.
- Increased diameter liquid chamber inlets to allow the formalin and ammonia solutions to be poured into the chambers more easily without spillage.

Decontamination Cycle

- Operator starts process by pressing a button on the touch pad.
- Pre-delay timer allows decontamination operator to seal the cabinet before vaporization of formalin commences. Delay period can be set from 1 to 59 minutes.
- Vaporization of formalin solution commences to release the formaldehyde gas to decontaminate the cabinet.
- LCD display will show reminder for operator to cycle the cabinet fans to ensure even distribution of the gas.
- Heater automatically cuts off when formalin solution has completely boiled off.
- Contact time timer starts to regulate the period for which the formaldehyde gas is exposed to the cabinets' internal surfaces for the decontamination to take effect.
- Neutralization process begins automatically, to vaporize the ammonia solution to neutralize the formaldehyde gas.
- Neutralization timer starts to regulate the period for which the neutralization reaction takes place.

Control System Features



- Specifically designed for safety cabinet decontamination with automatic control and no manual intervention required through the entire decontamination cycle.
- In case of power failure the vaporizer will recover automatically once the power resumes; Microprocessor unit will self-reset in case of any processor failure.
- Pre-delay, contact time, neutralization timers, are adjustable using the easy clean touch control panel with large backlit LCD display on the front of the unit.
- Audible and visual alarms warn of overheating during a cycle.
- Password control to prevent decontamination timers from being adjusted by unauthorized personnel.



Typical operation of the formalin vaporizer within a biological safety cabinet.

Common List of Equipments Used

- Device to measure the formaldehyde concentration.
- Device to measure the ammonia concentration.
- Tubes with a measuring range of 0-100 ppm are recommended.
- Spore strips (optional).

Appropriate Protective Clothing

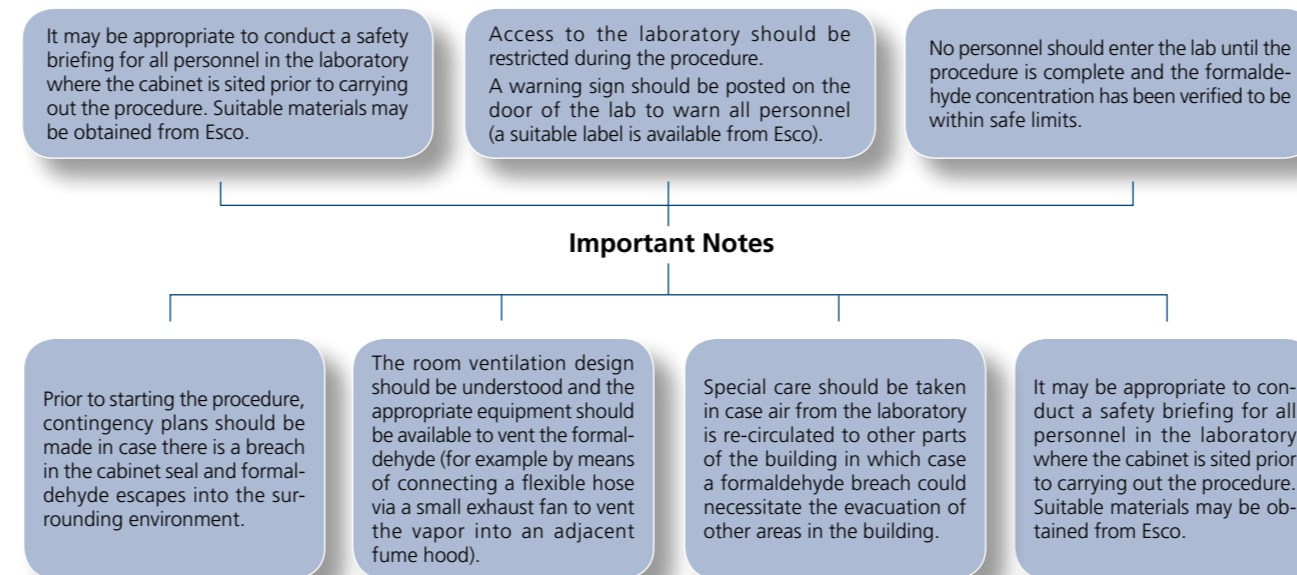
- A solid front, back closing, full body, long-sleeved disposable lab gown.
- Disposable shoe covers.
- Disposable surgical / PVC gloves for

hand protection. Gloves should be pulled over the knitted wrists of the gown rather than worn inside. Double gloving should be considered. Gloves should be worn while handling the formalin and ammonia solutions. Nitrile gloves, which exhibit a high resistance to formaldehyde and are less prone to cause allergic skin reactions as compared to latex, should be used.

Apparatus

- Beaker
- Measuring cylinder
- Tape (3M-3939 is recommended)
- Air-tight bag that can enclose the entire cabinet (can be ordered from Esco)
- Measuring tape
- Biohazard waste bag
- Hand-drill, screwdriver, and socket key (M4 and M5)

General Specifications, Formalin Vaporizer		
<i>Note to customer: Insert electrical voltage number into last model number digit _ when ordering.</i>		
Model	FV-00_	
Dimensions (W x D x H)	350 x 293 x 310 mm 13.8" x 11.5" x 12.2"	
Vaporizer Construction	Stainless steel grade 304	
Maximum Capacity	800 ml (27 oz)	
Max Cabinet Volume for Decontamination	For Room with RH <60% 4.7 m ³ (166 cu.ft.) For Room with RH >60% 9.4 m ³ (332 cu.ft.)	
Electrical	220-240V, AC, 50Hz, 1Ø	
	Cabinet Full Load Amps (FLA)	1.25 A
	Cabinet Nominal Power	300 W
	Cabinet BTU	1024
	110-120V, AC, 60Hz, 1Ø	
	Cabinet Full Load Amps (FLA)	3 A
Cabinet Nominal Power	300 W	
Cabinet BTU	1024	



Decontamination Process

Calculate the amount of 37% formalin, 25% ammonia, and water required, which is 85 ml each, for every 1 cubic meter volume to be decontaminated.

Water is poured into the formalin tank to increase the decontamination area humidity to be above 60%. If the room humidity already exceeds 60%, and the formalin tank usage needs to be optimized to decontaminate a large space, such as a small room, then there is no need to add water. Please note that the water shall not be poured into the ammonia tank because it will not assist in the decontamination process.

To anticipate a "worst case scenario", a relatively "large size" biological safety cabinet, with the body height of 1.7 m

(67 inches) and width of 0.9 m (35 inches), mounted on a "tall" 90 cm (35 inches) standing height support stand, will have the volume enclosed by the air tight bag, and the corresponding required solution mixture, approximately as follows:

Cabinet Width	2ft / 0.6m	3ft / 0.9m	4ft / 1.2m	5ft / 1.5m	6ft / 1.8m
Volume (m ³)	1	1.5	2	2.5	3
37% Formalin (ml)	85	128	170	213	255
25% Ammonia (ml)	85	128	170	213	255
Water (ml) - optional	85	128	170	213	255

Smaller size cabinets, especially when installed on a 70 cm (28 inches) sitting height support stand, require less formalin, ammonia, and water from the table above.

The actual volume to be decontaminated must be measured on site, as it varies from one cabinet to another. The figures on the table above are given for comparative purpose only.

Decontamination Steps

