

ACID FUME CUPBOARDS

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PREFACE

Our goal with this material is to guide you through the essential considerations and decision points to ensure you select the right fume cupboard for your needs. Fume cupboards used for handling acids and acidic substances, as well as those operating with acids at high temperatures, require special attention to provide maximum safety and longevity.

Safety is our top priority, which is why it is crucial to choose a model and type designed to withstand the specific challenges you face. A robust mechanical construction is essential to ensure the fume cupboard can endure daily use while protecting users from potential hazards.

Surface protection and material selection are other critical factors. Our fume cupboards are equipped with acid-resistant surfaces and materials that extend their lifespan and ensure they can withstand the aggressive chemicals used in the laboratory.

Maintenance and servicing are necessary to maintain a safe working environment and prolong the fume cupboard's lifespan. We offer well-designed solutions that make regular maintenance easy and ensure optimal functionality throughout the cupboard's lifetime.

Throughout this material, we will present the key elements you should consider when selecting a fume cupboard. Our expertise and experience are at your disposal, helping you make an informed decision that safeguards both you and your equipment.

We hope this material will be a valuable resource in your decision-making process. If you have any further questions or require guidance, our team is ready to assist you.

CATEGORIES

Zystm has chosen to categorize fume cupboards used for working with acids or acidic substances into the following categories:

- Fume cupboards for working with weak acids or acidic substances
- Fume cupboards for working with weak acids or acidic substances and moderate heat
- Fume cupboards for working with strong acids
- Fume cupboards for working with strong acids and high heat
- Fume cupboards for working with perchloric acid and possible high heat (HClO_4)
- Fume cupboards for working with hydrofluoric acid (HF)



FUME CUPBOARDS FOR WORKING WITH WEAK ACIDS OR ACIDIC SUBSTANCES

COMMONLY REFERRED TO AS: ZAFE 81, ZAFE 82, AND ERGO ZAFE 83

DEFINITION

This fume cupboard is exclusively intended for working with weak acids, with no heat involved.

FUME CUPBOARD CONSTRUCTION

- The interior of the fume cupboard is lined with laminate.
- The extraction duct is made of galvanized steel or polypropylene.
- Metal components are either made from acid-resistant stainless steel or coated with polyester powder paint.
- Worktop materials can include: polypropylene, epoxy, acid-resistant stainless steel, or a ceramic material.
- The front glass is made of tempered safety glass.
- There is no temperature monitoring in the fume cupboard.
- The fume cupboard is available with a height-adjustable worktop/cabinet.

CONSIDERATIONS

Choosing this fume cupboard is close to selecting a standard fume cupboard, with only a few exceptions, making it more cost-effective than an acid fume cupboard. Since the work involves only handling weak acids or acidic substances, there are more options for selecting the worktop material.

As stainless steel is typically visually affected by substances that come into contact with its surface — and as cleaning and maintenance are needed to maintain its original appearance — we recommend using a polypropylene, epoxy, or ceramic worktop instead.

CERTIFICATION OF THE FUME CUPBOARD

If certification of the fume cupboard is required, it will fall under EN 14175 Part 3, which covers the testing and certification of standard fume cupboards. This model will not require compliance with EN 14175 Part 7, as the testing in EN 14175 Part 3 is sufficient.

Additionally, in Denmark, it is required that the fume cupboard undergoes tracer gas testing according to DS 457 in the laboratory before it is put into operation.



MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced at 12-month intervals, depending on usage. For safety reasons, it is crucial that mechanical components, load-bearing parts, and the ventilation system are checked frequently, at a minimum following the suggested interval.

Zystm offers a service package specifically designed for this type of fume cupboard.

FUME CUPBOARDS FOR WORKING WITH WEAK ACIDS OR ACIDIC SUBSTANCES AND MODERATE HEAT (<40°C)

COMMONLY REFERRED TO AS: ZAFE 81, ZAFE 82, AND ERGO ZAFE 83

DEFINITION

This fume cupboard is exclusively intended for working with weak acids and only with moderate heat (<40°C).

FUME CUPBOARD CONSTRUCTION

- The interior of the fume cupboard is lined with laminate.
- The extraction duct is made of galvanized steel or polypropylene.
- Metal components are either made from acid-resistant stainless steel or coated with polyester powder paint.
- Worktop materials can include: epoxy, acid-resistant stainless steel, or a ceramic material.
- The front glass is made of tempered safety glass.
- There is no temperature monitoring in the fume cupboard.
- The fume cupboard is available with a height-adjustable worktop/cabinet.

CONSIDERATIONS

Choosing this fume cupboard is close to selecting a standard fume cupboard, with only a few exceptions, making it more cost-effective than a specialized acid




fume cupboard. Since the work involves only handling weak acids or acidic substances, there are more options for selecting the worktop material.

As stainless steel is typically visually affected by substances that come into contact with its surface—and as cleaning and maintenance are needed to maintain its original appearance—we recommend using polypropylene, epoxy, or a ceramic worktop instead.

CERTIFICATION OF THE FUME CUPBOARD

If certification of the fume cupboard is required, it will fall under EN 14175 Part 3, which covers the testing and certification of standard fume cupboards. This model will not require compliance with EN 14175 Part 7, as the testing in EN 14175 Part 3 is sufficient.

<p>Testing Institute: I.F.I., Institut für Industrieaerodynamik GmbH</p> <p>Address: Welkenrath Straße 120 D-52074 Aachen</p> <p>Head of testing station: Dipl.-Ing. B. Konrath</p> <p>Directors of Institute: Dipl.-Ing. B. Konrath Dr.-Ing. R.-D. Lieb</p>	<p>Type testing of fume cupboard according to EN 14 175-3:2004</p> <p>Certificate No. 1/FC-EZ12/P3/02/13</p>	 <p>I.F.I. Institut für Industrieaerodynamik GmbH Institut an der Fachhochschule Aachen</p>
<p>Fume cupboard: Designation : ERGO ZAFE 15 Width = 1200 Type : Bench-type, Width = 1200 mm Manufacturer : Zystm A/S Address : Smedevci 1</p>		

Additionally, in Denmark, it is required that the fume cupboard undergoes tracer gas testing according to DS 457 in the laboratory before it is put into operation.

MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced at 12-month intervals, depending on usage. For safety reasons, it is crucial that mechanical components, load-bearing parts, and the ventilation system are checked frequently, at a minimum following the suggested interval. Zystm offers a service package specifically designed for this type of fume cupboard.

FUME CUPBOARDS DESIGNED FOR WORKING WITH STRONG ACIDS

COMMONLY REFERRED TO AS: ZAFE 81 AC OR ERGO ZAFE 83 AC

DEFINITION

This fume cupboard is intended for working with strong acids, without exposure to high temperatures.

FUME CUPBOARD CONSTRUCTION

- The interior of the fume cupboard is lined with polypropylene.
- The extraction duct is made of polypropylene.
- Metal components are coated with technical Teflon polytetrafluoroethylene (PTFE), giving them a black appearance.
- Worktop materials can include: polypropylene, epoxy, or ceramic, with ceramic being the most suitable choice.
- The front glass is made of tempered safety glass.
- The front glass is top-hinged with wire suspension
- There is no temperature monitoring in the fume cupboard.
- It is recommended that the fume cupboard be supplied with a fixed height to avoid height adjustment. This is because height adjustability requires flexible ductwork, which must be highly resistant to chemicals.
- Fittings can be Teflon-coated, depending on requirements.

BROENLAB:

Standard: Suitable for most applications, color 2700.

Special: Satin Chrome TI69 (chrome/silver-colored), ideal for solvents like acetone.

Special: Chemicoat TI55 with Teflon coating, a more expensive solution.

ARMALAB:

Standard: Epoxy-coated with a smooth surface, resistant to acids to a certain degree.

Optional: Polypropylene (PP), typically used for the back wall.

For fitting rail mounting, PP is available in special versions.

CONSIDERATIONS

By choosing this fume cupboard, you are selecting a model specifically prepared for handling strong acids. Due to the nature of strong acids, there are limited

options for the worktop material. We recommend using polypropylene, epoxy, or ceramic, with ceramic being the most suitable choice for durability and resistance.

CERTIFICATION OF THE FUME CUPBOARD

If certification is required, this fume cupboard must comply with EN 14175 Part 7, which covers the testing and certification of acid fume cupboards.

Additionally, in Denmark, it is required that the fume cupboard undergo tracer gas testing according to DS 457 in the laboratory before it is put into use.



MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced at 6-12 month intervals, depending on usage. For safety reasons, it is crucial that mechanical components, load-bearing parts, and the ventilation system are frequently checked, at a minimum following the suggested interval.

Zystm offers a service package specifically designed for this type of fume cupboard.

FUME CUPBOARDS DESIGNED FOR WORKING WITH STRONG ACIDS AND HIGH HEAT

COMMONLY REFERRED TO AS: ZAFE 81 AC HH OR ERGO ZAFE 83 AC HH

DEFINITION

This fume cupboard is intended for working with strong acids and high temperatures.

FUME CUPBOARD CONSTRUCTION

- The interior is lined with polypropylene.
- Equipped with a ceramic heat shield above the worktop to protect the cabin from heat radiation.
- The extraction duct is made of polypropylene.
- Metal components are coated with technical Teflon polytetrafluoroethylene (PTFE), resulting in a black appearance.
- Worktop material: Ceramic only, to withstand high temperatures and strong acid exposure.
- The front glass is made of tempered safety glass.
- The front glass is top-hinged with wire suspension.
- Includes temperature monitoring.
- It is recommended to install the fume cupboard at a fixed height, avoiding height adjustment to prevent the need for highly chemical-resistant flexible piping.
- Fittings can be Teflon-coated, depending on requirements, and should always be rinsed after boiling processes.

BROENLAB:

Standard: Suitable for most applications, color 2700.

Special: Satin Chrome TI69 (chrome/silver-colored), ideal for solvents like acetone.

Special: Chemicoat TI55 with Teflon coating, a premium solution.

Special: Chemicoat TI55. Teflon coating. Expensive solution.

ARMALAB:

Standard: Epoxy-coated with a smooth surface, resistant to acids to a certain degree.

Optional: Polypropylene (PP), typically used for the back wall.

For fitting rail mounting, special PP versions are available.

VENTILATION AND PROCEDURE

During high-heat processes, special precautions must be taken to ensure the safety and integrity of the system.

When working under such conditions, the following procedures must be followed:

- Closed sash
The fume cupboard sash must remain closed throughout the entire process to prevent accidental releases and exposure to hazardous substances.
- Forced operation (airflow)
The fume cupboard is equipped with a forced airflow of 1500 m³/h, ensuring adequate ventilation and vapour removal. It is essential that this operation remains active throughout the entire process to maintain safety.
- Temperature monitoring
The fume cupboard is equipped with temperature monitoring. If the system alerts that the temperature exceeds established limits, immediate measures must be taken to reduce the temperature, such as adjusting heating settings.

RECOMMENDATIONS FOR THE VENTILATION CONTRACTOR

- Ducts and liquid drainage
It is recommended that ventilation ducts be installed in a way that allows liquids to drain away from the fume cupboard and dampers to prevent the accumulation of liquids, which could cause damage or hinder proper operation.



- Liquid drainage system

A drain should be established for routine, systematic drainage of liquid from the duct system to prevent buildup that could lead to corrosion or chemical reactions.

These measures are important to ensure that processes are conducted safely and that the fume cupboard functions optimally under high-temperature conditions.

CONSIDERATIONS

Choosing this fume cupboard ensures suitability for working with strong acids and high heat. Given the extreme conditions, we strongly recommend a ceramic worktop, as high temperatures and high acid concentrations can severely damage other materials.

CERTIFICATION OF THE FUME CUPBOARD

For certification, this fume cupboard must comply with EN 14175 Part 7, which covers testing and certification of acid fume cupboards.

Additionally, in Denmark, it is required that the fume cupboard undergo tracer gas testing according to DS 457 in the laboratory before being put into use.

MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced at 3-6 month intervals, depending on its use. For safety reasons, it is critical that mechanical components, load-bearing parts, and the ventilation system are frequently checked, at a minimum, according to the suggested interval. Zystm offers a service package specifically designed for this type of fume cupboard.



FUME CUPBOARDS DESIGNED FOR WORK WITH PERCHLORIC ACID (HClO₄) AND POTENTIAL HIGH HEAT

COMMONLY REFERRED TO AS: ZAFE 81 PERCHLORIC ACID OR ERGO ZAFE 83 PERCHLORIC ACID

DEFINITION

Work is conducted with perchloric acid, and high temperatures are involved.

CONSTRUCTION OF THE FUME CUPBOARD

- The interior of the fume cupboard is lined with polypropylene.
- The fume cupboard is equipped with a »wash down system« in the ventilation duct and that rinses behind the back panel.
- The fume cupboard features a ceramic heat shield above the worktop.
- The exhaust duct is made of polypropylene and equipped with water nozzles.
- Metal parts are coated with technical Teflon polytetrafluoroethylene (PTFE) and are therefore black.
- The worktop material can be made of ceramic.
- The front glass is made of tempered safety glass.
- The front glass is top-hinged with a wire.
- There is temperature measurement inside the fume cupboard.
- Due to the »wash down system,« a significant pressure loss is expected, which can only be measured once the cupboard is operational.
- It is recommended that the fume cupboard is delivered with a fixed height to avoid height adjustment, as this requires highly chemical-resistant flexible piping.
- Fittings can be Teflon-coated, depending on requirements.

BROENLAB:

Standard: Can withstand most conditions, color 2700.

Special: Satin chrome TI69. Chrome/silver-colored, suitable for e.g., acetone.

Special: Chemicoat TI55. Teflon coating. Expensive solution.

ARMALAB:

Standard: Epoxy-coated with a smooth surface. Can withstand acids to a certain extent.

Optional: PP (polypropylene) is standard for the back wall. Special PP is used for fitting rail mounting.

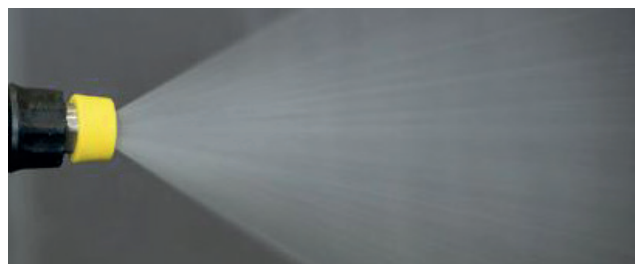
VENTILATION AND PROCEDURE

During high-heat processes, special precautions must be taken to ensure the safety and integrity of the system. When working under such conditions, the following procedures must be followed:

- Closed sash
The fume cupboard sash must remain closed throughout the entire process to prevent accidental releases and exposure to hazardous substances.
- Forced operation (airflow)
The fume cupboard is equipped with a forced airflow of 1500 m³/h, ensuring adequate ventilation and vapour removal. It is essential that this operation remains active throughout the entire process to maintain safety.
- Temperature monitoring
The fume cupboard is equipped with temperature monitoring. If the system alerts that the temperature exceeds established limits, immediate measures must be taken to reduce the temperature, such as adjusting heating settings.

RECOMMENDATIONS FOR THE VENTILATION CONTRACTOR

- Ducts and liquid drainage
It is recommended that ventilation ducts be installed in a way that allows liquids to drain away from the fume cupboard and dampers to prevent the accumulation of liquids, which could cause damage or hinder proper operation.



- **Liquid drainage system**

A drain should be established for routine, systematic drainage of liquid from the duct system to prevent buildup that could lead to corrosion or chemical reactions.

These measures are important to ensure that processes are conducted safely and that the fume cupboard functions optimally under high-temperature conditions.

CONSIDERATIONS

Choosing this fume cupboard means opting for a solution designed for work with perchloric acids and high heat. Since the work involves handling and operating with strong acids and high temperatures, only a fully integrated polypropylene cabinet is suitable. Therefore, special attention must be paid to what is placed on the worktop. Heating units should be positioned on a ceramic tile to create a barrier between the heat source and the worktop.

CERTIFICATION OF THE FUME CUPBOARD

If the customer requires the fume cupboard to be certified, the applicable standard will be EN14175 part 7, which covers testing and certification of acid-resistant fume cupboards. Additionally, Danish regulations require that the fume cupboard undergoes a tracer gas test according to DS 457 in the laboratory before it is put into use.

MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced every 3-6 months, depending on its usage. For safety reasons, it is crucial to regularly check mechanical parts, load-bearing components, and the ventilation system, with at least the mentioned interval. Zystm offers a service package specifically tailored for this type of fume cupboard.



FUME CUPBOARDS DESIGNED FOR WORK WITH HYDROFLUORIC ACID (HF)

COMMONLY REFERRED TO AS: ZAFE 81 HYDROFLUORIC ACID OR ERGO ZAFE 83 HYDROFLUORIC ACID

DEFINITION

Work is conducted with Hydrofluoric Acid (HF), and high temperatures may occur.

CONSTRUCTION OF THE FUME CUPBOARD

- The interior of the fume cupboard is lined with polypropylene.
- The fume cupboard is equipped with a ceramic heat shield above the worktop to protect the cabinet from heat radiation.
- The exhaust duct is made of polypropylene.
- Metal parts are coated with technical Teflon polytetrafluoroethylene (PTFE) and are therefore black.
- The worktop material is made of ceramic.
- The front window is made of transparent plastic material (PVC-U). Frequent replacement of the front window should be expected, depending on usage.
- The front window is top-hinged with a wire.
- There is temperature measurement inside the fume cupboard.
- It is recommended to deliver the fume cupboard at a fixed height, avoiding height adjustment, as this requires highly chemical-resistant flexible piping.
- Fittings can be Teflon-coated, depending on requirements.

BROENLAB:

Standard: Can withstand most conditions, color 2700.

Special: Satin chrome TI69. Chrome/silver-colored, suitable for e.g., acetone.

Special: Chemicoat TI55. Teflon coating. Expensive solution.

ARMALAB:

Standard: Epoxy-coated with a smooth surface. Can tolerate acids to a certain extent.

Optional: PP (polypropylene) is standard for the back wall. Special PP is used for fitting rail mounting.

VENTILATION AND PROCEDURE

During high-heat processes, special precautions must be taken to ensure the safety and integrity of the system.

When working under such conditions, the following procedures must be followed:

- Closed sash
The fume cupboard sash must remain closed throughout the entire process to prevent accidental releases and exposure to hazardous substances.
- Forced operation (airflow)
The fume cupboard is equipped with a forced airflow of 1500 m³/h, ensuring adequate ventilation and vapour removal. It is essential that this operation remains active throughout the entire process to maintain safety.
- Temperature monitoring
The fume cupboard is equipped with temperature monitoring. If the system alerts that the temperature exceeds established limits, immediate measures must be taken to reduce the temperature, such as adjusting heating settings.

RECOMMENDATIONS FOR THE VENTILATION CONTRACTOR

- Ducts and liquid drainage
It is recommended that ventilation ducts be installed in a way that allows liquids to drain away from the fume cupboard and dampers to prevent the accumulation of liquids, which could cause damage or hinder proper operation.

- Liquid drainage system

A drain should be established for routine, systematic drainage of liquid from the duct system to prevent buildup that could lead to corrosion or chemical reactions.

These measures are important to ensure that processes are conducted safely and that the fume cupboard functions optimally under high-temperature conditions.

CONSIDERATIONS

Choosing this fume cupboard means selecting equipment prepared for work with Hydrofluoric Acid and high heat. Since the work involves handling strong acids and high temperatures, only a ceramic worktop is suitable. We recommend using a ceramic worktop, as the high heat and strong acid concentration can severely damage other materials.

MAINTENANCE AND INSPECTION

It is recommended that the fume cupboard be inspected and serviced every 3-6 months, depending on its usage. For safety reasons, it is crucial to regularly check mechanical parts, load-bearing components, and ventilation, with at least the above-mentioned interval. Zystm offers a service package specifically tailored for this type of fume cupboard.



WHAT DEFINES STRONG AND WEAK ACIDS?

Strong and weak acids are defined by their ability to dissociate (ionize) in an aqueous solution, meaning how completely they release their protons (H^+ ions) in water.

STRONG ACIDS

- Definition: A strong acid is an acid that completely dissociates in water. This means that when a strong acid is dissolved in water, almost all acid molecules release H^+ ion, resulting in a high concentration of H^+ ions in the solution.
- Examples of strong acids: Hydrochloric acid (HCl), Sulfuric acid (H_2SO_4), Nitric acid (HNO_3), Perchloric acid ($HClO_4$)

WEAK ACIDS

- Definition: A weak acid is an acid that only partially dissociates in water. In a solution of a weak acid, only a small fraction of the acid molecules release H^+ ion, meaning that there is a lower concentration of H^+ ions compared to a strong acid.
- Examples of weak acids: Acetic acid (CH_3COOH), Formic acid ($HCOOH$), Citric acid ($C_6H_8O_7$)

KEY DIFFERENCES

- Dissociation: Strong acids completely dissociate, while weak acids only partially dissociate.
- pH: A solution of a strong acid will have a lower pH value (more acidic) than a solution of a weak acid at the same concentration.
- Acid Strength: This is often quantified using the acid dissociation constant (K_a). Strong acids have very high K-values, while weak acids have lower K-values.

RESISTANCE LIST

WORKTOPS	ACID/ ALKALI	SOLVENT	DISCOLORATION	HEAT	SCRATCH RESISTANCE	PRICE INDEX
Laminate	☹️	😊	☹️	☹️	😐	1
Compact laminate	😐	😊	😐	😐	😐*	2
Compact laminate Max	😊	😊	😊	😐	😐*	3
Epoxy	😊	😊	😊	😊	😐**	4
Polypropylene (PP)	😊	😊	😐	☹️	☹️*	3
Acid resistant stainless steel 316	😐	😊	😊	😐**	☹️*	3
Ceramics	😊	😊	😊	😊	😊	9

😊 Resistant, no attack

😐 Limited resistance, low impact/discoloration after prolonged exposure

☹️ Reduced resistance

*: Only cosmetic

** : Heat; risk that the steel plate is freed from the core material, otherwise no change.

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