



A Donaldson Company

A WORLD LEADER IN FUME
EXTRACTION TECHNOLOGY

AM400

USER MANUAL

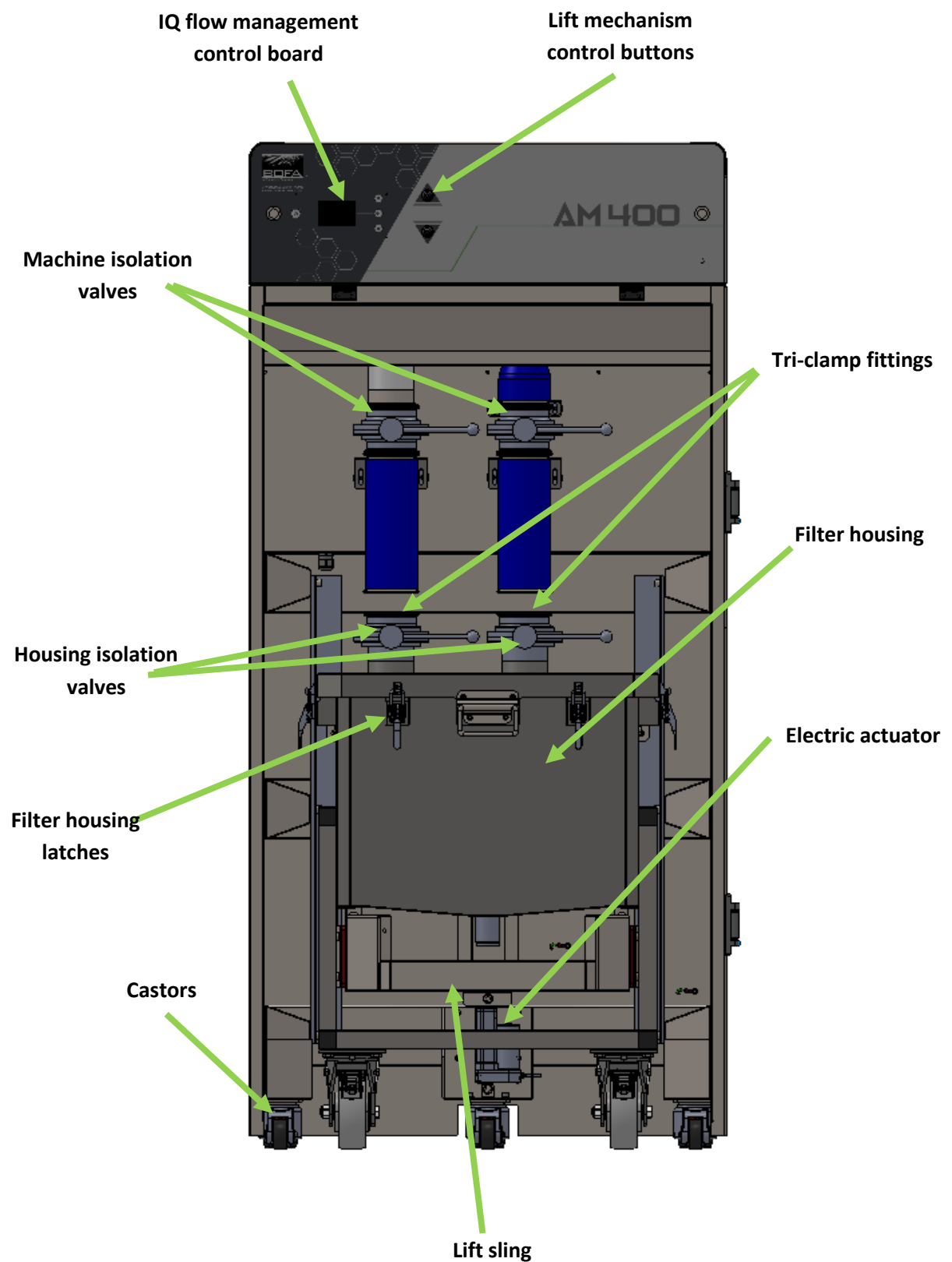


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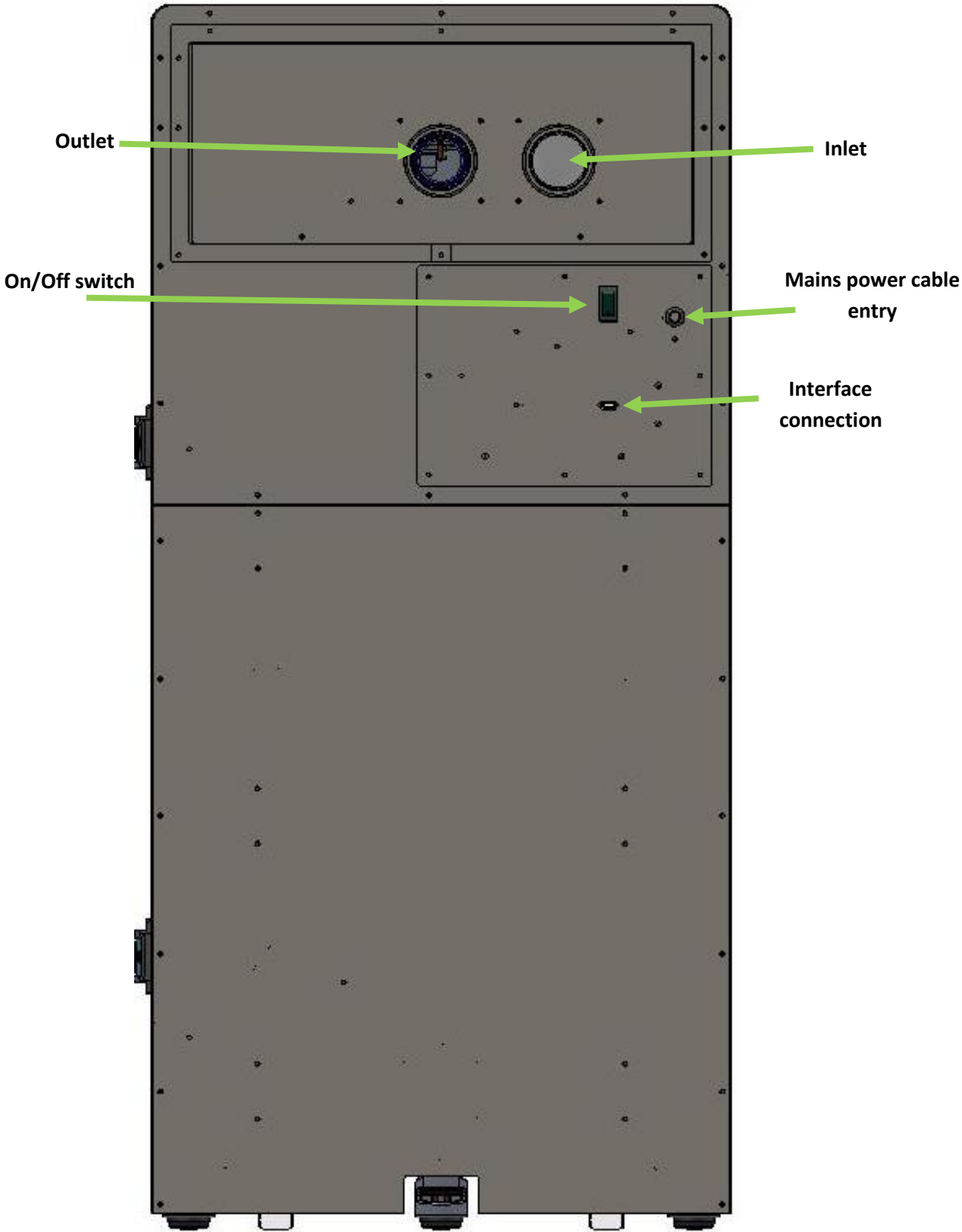
Overview

101



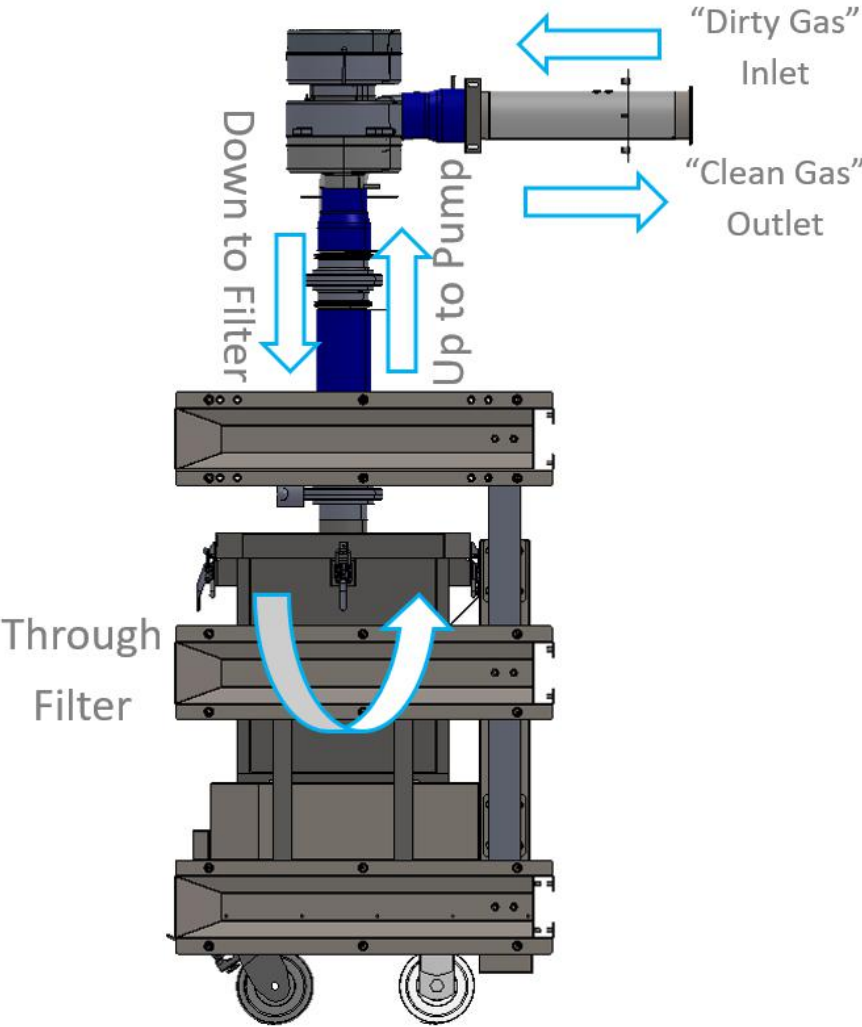
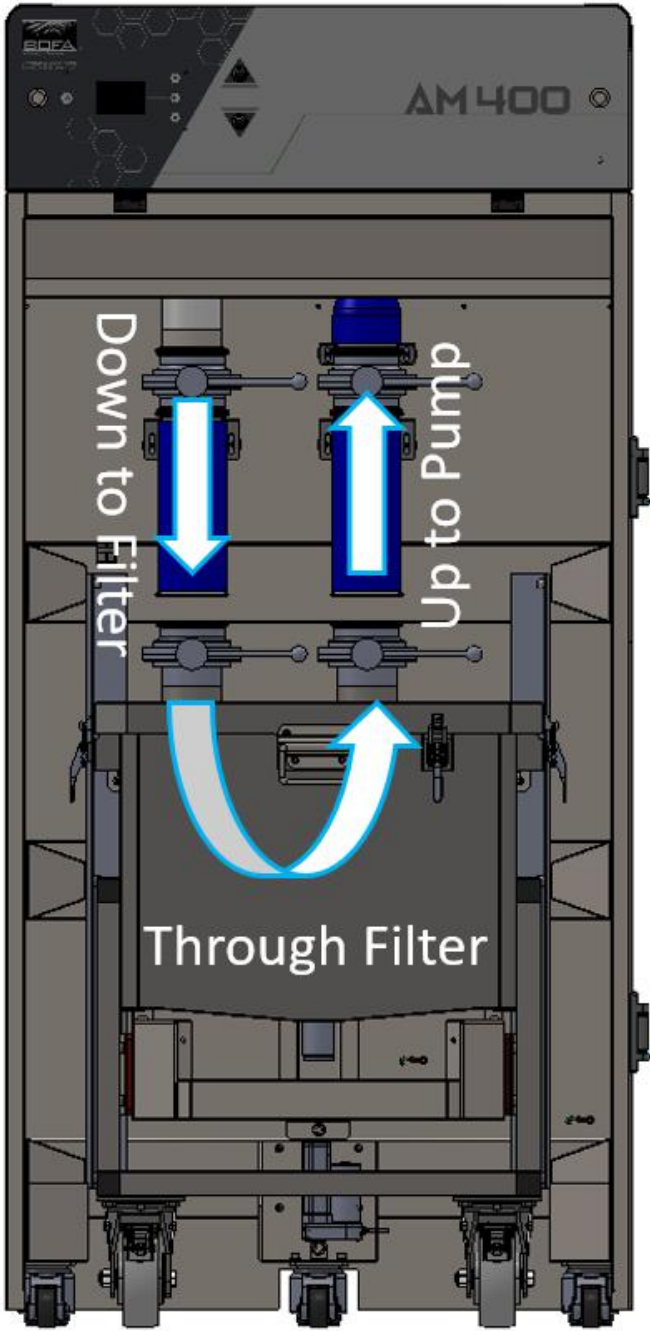
Overview

102



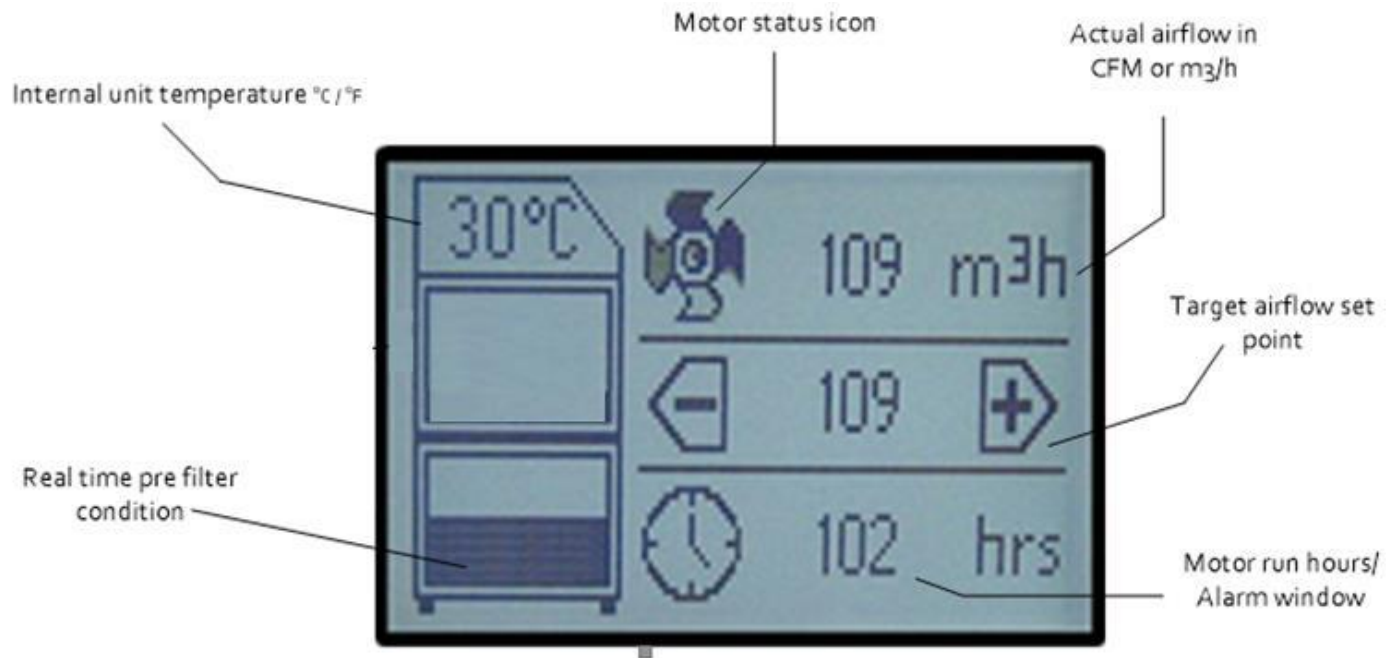
Overview

103



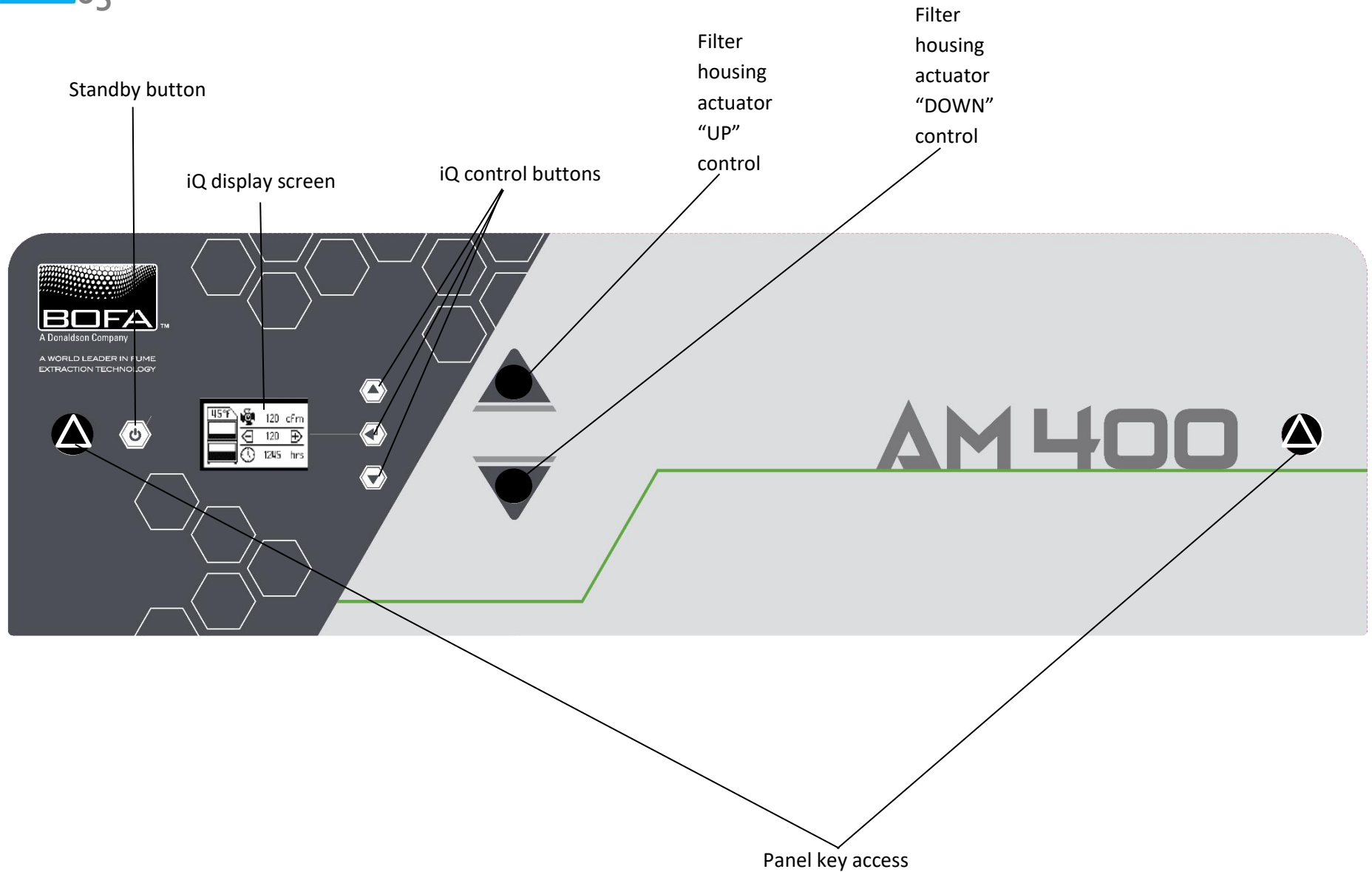
Overview

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Overview

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Safety Instructions



Important safety notes

Concerning symbols used on the extraction unit and referred to within this manual.



Danger

Refers to an immediately impending danger. If the danger is not avoided, it could result in death or severe (crippling) injury. Please consult the manual when this symbol is displayed.



Warning

Refers to a possibly dangerous situation. If not avoided it could result in death or severe injury. Please consult the manual when this symbol is displayed.



Caution

Refers to a possibly harmful situation. If not avoided, damage could be caused to the product or something in its environment.



Important (Refer to manual)

Refers to handling tip and other particularly useful information. This does not signify a dangerous or harmful situation. Refer to manual when this symbol is displayed.

Electrical Safety

The unit has been designed to meet the essential Health and Safety requirements of the Machinery Directive 2006/42/EC. This is achieved by ensuring conformity with the requirements of the Low Voltage Directive 2014/35/EC. The requirements of the EMC Directive 2014/30/EU are also met

Warning

When working with the pump/motor housing open, Live 115 or 230 volt mains components are accessible. Ensure that the rules and regulations for work on live components are always observed.

Important

To reduce the risk of fire, electric shock or injury:

1. Always isolate the system from the mains power supply before removing the pump/motor access panel.
2. Use only as described in this manual.
3. Connect the system to a properly grounded outlet.

Dangers to eyes, breathing and skin

Once used, the filters within the AM 400 system may contain a mixture of particulates, some of which may be sub-micron size. When the used filters are moved it may agitate some of this particulate, which could get into the breathing zone and eyes of the operative. Additionally, depending on the materials being processed, the particulate may be an irritant to the skin.

This unit should not be used on processes with sparks of flammable materials or with explosive dusts and gases, without implementation of additional precautions.

Caution: When changing used filters the PPE in section 2.02 must be adhered to.

BOFA Technical Service

If a problem arises with your AM 400 system, or if it displays a fault code, please refer to the troubleshooting guide section 8 of this manual. If the problem is still not resolved, please:

- Visit our website at www.bofa.co.uk for on-line help.
- Or contact the helpline on **+44 (0) 1202 699444**, Mon-Fri, 9am-5pm.
Email: Technical@bofa.co.uk

Safety Instructions



Warning and Information labels

The following listing details labels used on your AM400 unit.

Goggles, Gloves & Mask Label



Location: Front face of filter

Meaning: Wear PPE that is appropriate for the activities around you (For example powder change out on the machine next to your work station may require you to wear the same level of PPE). While potential exposures are typically lowest during the printing stage, work surfaces might still be contaminated with metal powders. If printing is interrupted, use the level of PPE needed when the machine is open. Follow proper PPE replacement practices. Recommended PPE includes: Nitrile or chemical resistant gloves, lab coat or overalls, safety glasses, goggles or face shields, respiratory protection when indicated and engineering controls cannot control exposures, and in accordance with federal regulations (29 CFR 1920.134).



Electrical Danger

Location: Rear upper & lower access Panels and internal motor access panel.

Meaning: Removal of panels with this label attached will allow access to potentially live components.

Warning Label



Location: Top left front door panel.

Meaning: Power should be isolated before the panel with this label attached is opened/ removed.

Serial Number Label

Location: Rear electrical panel.

Meaning: This label contains a variety of information about the extraction unit, including.

- *Example of serial number



PLEASE NOTE: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment maybe compromised.

Fire Risk Warning

In the very rare event that a significant quantity of oxygen is drawn into the fume extraction unit, it may be possible that the filter will ignite.

Whilst any resultant fire would typically be retained within the fume extraction unit, the damage to the extractor could be significant. It is therefore essential to minimise the possibility of this occurring by undertaking an appropriate Risk assessment to determine:-

- a). Whether additional fire protection equipment should be installed.
- b). Appropriate maintenance procedures to prevent the risk of build-up of debris which could potentially combust.

Before installation

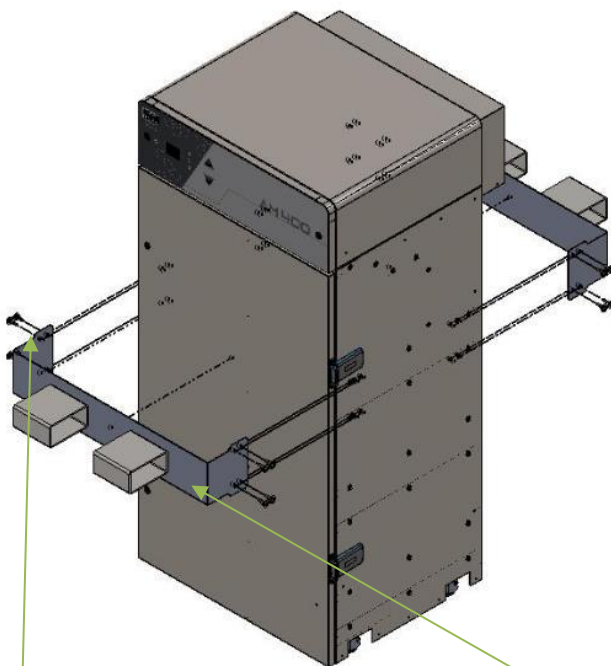
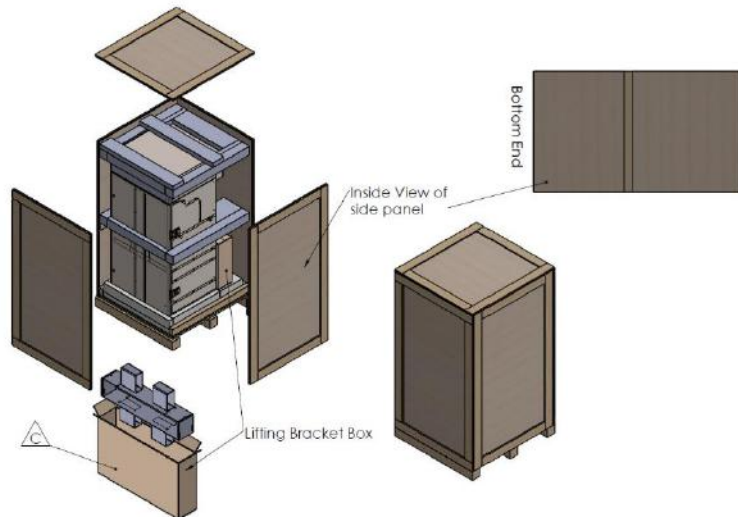


Inner transit packaging removal & unit placement

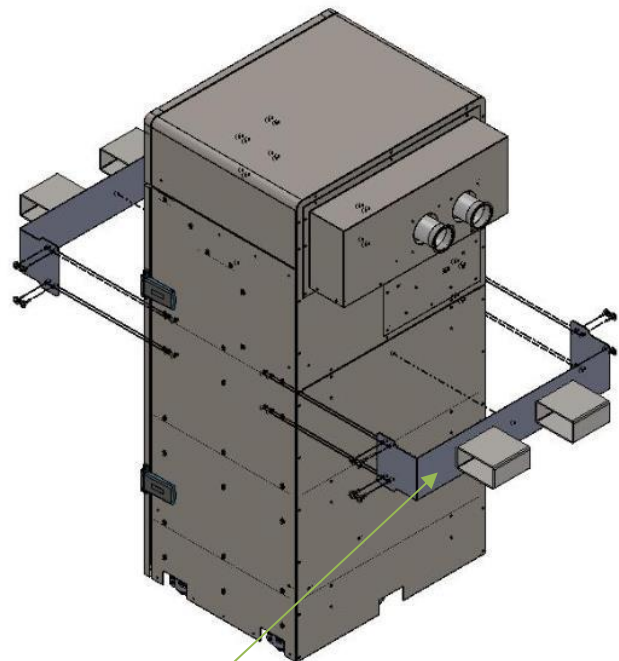
Before installation, check the extraction unit for damage. All packaging must be removed before the unit is connected to the power supply.

Please read all instructions in this manual before using this extractor.

1. Move the packaged unit to the location where it is going to be installed and remove the outer packaging, by removing the screws in each exterior packaging panel, excluding the base.
2. Attach the lifting bracket to the front and rear of the unit using 8x M8 washers and bolts as supplied, ensuring these are tightened using appropriate tools.
3. Using a forklift, lift the unit using the attached lifting bracket, once removed from the base it can be manoeuvred into place using the extractors castors.
4. The extractor should then be connected to the machine requiring extraction by following the manufacturers guidelines.



M8 washers and bolts



Lifting bracket

Installation



The AM400 has been designed to remove and filter fume containing potentially hazardous particulate generated during manufacturing processes. Such hazardous substances are captured within a single stage filtration system after which the cleaned gas is returned to the process.

General Guidelines for a successful installation and to achieve optimal performance:

- Keep duct run length to a minimum
- Avoid sharp bends / turns in the ductwork
- Avoid multiple bends / turns in the ductwork
- Use a larger diameter duct where possible (To the maximum diameter of the inlet & outlet)
- Position the capture device as close as possible to the mating machine.

All ductwork should be installed and connected to the extraction unit before the iQ system is turned on.

Installation



Connection to Power Supply

Please follow the specification at the rear of the manual when selecting the power supply outlet for the AM400 system, ensure the power supply is suitable before connecting the AM400 system.

Check the Integrity of the electrical power cable, if the supply cord is damaged the extraction unit should not be connected to the mains. The supply cord should only be replaced by a BOFA engineer as an electrical safety test may be required after replacement.

The AM400 system **MUST** be connected to a properly earthed outlet.



Connect the power cable to an isolated electrical supply.



The mains socket should be installed near the extractor it should be easily accessible and able to be switched On / Off. The cable run should be arranged so as not to create a trip hazard.

Installation



when the 2 cables are disconnected the motor will slow down and come to a stop.

The extractor will need to be turned on and be out of standby mode (See section 5 for turning the extractor on) in order for this feature to operate.

Remote Stop/Start feature

Enables the extraction unit to be remotely turned On / Off via an external signal.

This feature can be configured in 2 ways

- DC Voltage input – Range 12-24VDC
- Volt free input – Open / Closed contacts

Note: Care must be taken to ensure that the system is correctly wired in order for the extraction unit to function correctly.

DC Voltage input

This configuration requires the Black & Red cores of the signal cable (Refer to section 1 for location) to be connected to a known and tested DC power supply, in order to start the extractor.

The operating voltage for this signal is between 12 & 24VDC. Only voltages within this range should be connected. Voltages connected outside of this range may cause irreversible damage to the internal control PCB.

Red cable = V+

Black cable = V-

When the extractor is provided with the correct DC voltage the motor will start and maintain the set flow rate (Refer to section 5 for how to set the flow) when the DC voltage is removed the motor will slow down and come to a stop.

The extractor will need to be turned on and be out of standby mode (See section 5 for turning the extractor on) in order for this feature to operate.

Volt free input

This configuration requires the Black & Red cores of the signal cable (see section 1 for location) to be connected together, in order to start the extractor.

When the 2 cables are connected together the motor will start and maintain the set flow rate (see section 5 for how to set the flow)

Installation



Filter Blocked / System Fail Signal

The AM400 system will output a signal to alert the user when the extractor has failed or when the filters are blocked.

This feature will not directly stop the extractor from running correctly, but if fitted this feature should be terminated correctly before power is applied to the AM400 system.

Connection specification

This signal is available via the Green and White cores of the signal cable. The iQ system will provide a volt free Open / Closed signal that can be connected to an external interface, beacon or warning device following the specification below.

- **Maximum input voltage: 24V AC**
- **Maximum current load: 3A @ AC**
- **OR**
- **Maximum input voltage: 24V DC**
- **Maximum input load: 3A @ DC**

Filter Signal Configurations

The signal is configured, as detailed below.

Combined signal

With this configuration the Filter blocked & System fail signals will be linked together to give a combined single output.

When the filters become blocked or the iQ system develops a fault (Refer to section 8 for Troubleshooting & Error codes) the connection between the Green & White cables will become "Open"

When the extraction system is running normally the connection between the Green & White cables will become "Closed"

Operation



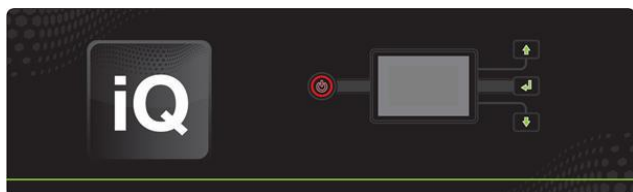
Turning extraction unit On

There are 2 stages to powering up your AM 400 extraction unit. Firstly the main isolation switch must be switched to the "On" position.

This will place the extraction unit in Standby mode, indicated by the front panel standby button glowing Red.

To start the extraction unit press the front panel power button (refer to section 1 for switch location) the button will change from Red to Green indicating the extraction unit is now fully On.

Standby



On

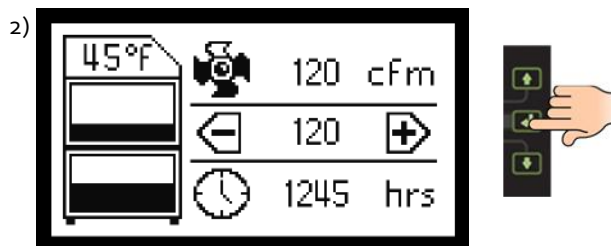


Changing the display units

The Flow rate and temperature readings can be displayed in 2 ways.

1. Temperature displayed as °C
Flow rate displayed as m³/h
OR
2. Temperature displayed as °F
Flow rate displayed as CFM

The display value can be changed by pressing the "Enter" button once.



Operation



Setting the desired flow rate

The iQ system features automatic flow control. This enables the user to set the required flow rate rate, then over time as the filters begin to block the motor will automatically begin to increase in speed to compensate for any loss in performance caused by the added restriction of the partially blocked filters.



The extractor and all pipe work must be fully installed and connected before the flow rate is set.

To set the flow rate

(The flow rate can be set between 150-300m³/h)

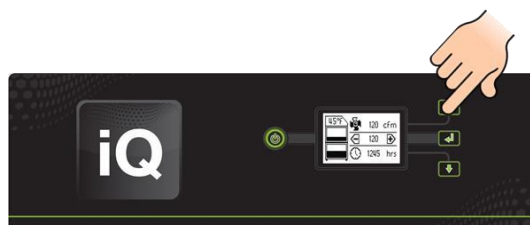
1. Press and hold the "Enter" (middle) button (Refer to section 1 for button location) for 3 seconds, or until all 3 button lights flash green.
2. Release the Enter button, the iQ system is now in set mode. Press either the Up or Down button to adjust the flow rate accordingly. Real time flow rate is displayed on the LCD screen, Refer to section 1 for Display information)
3. Once you have your desired flow rate, leave the controls, after around 10seconds the flashing buttons will illuminate constantly to confirm the flow rate is stored.

The set flow rate will now be maintained throughout the life of the filter. When the extraction unit can no longer maintain the set flow rate an alarm will be given and the display will indicate which filter should be changed.

1)



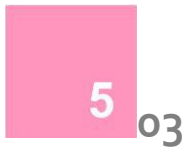
2)



3)



Operation

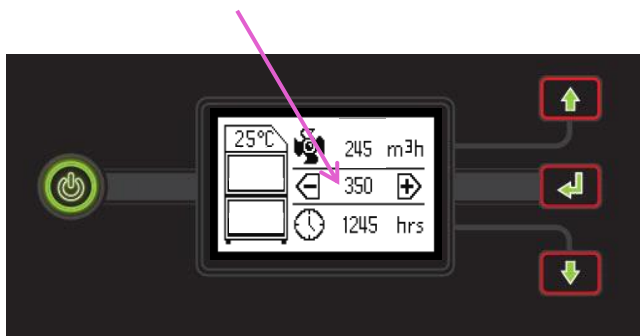


Flow rate Auto Adjust (first installation only)

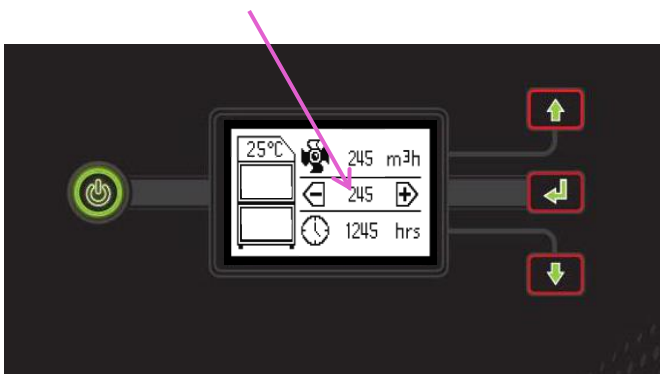
When first setting the flow rate on your new extraction unit the iQ will detect if the desired flow rate is achievable with the installation that has been connected to the extraction unit.

If the installation is causing too much restriction for the desired flow rate to be reached, the Auto Adjust feature will be activated. The procedure events are listed below.

- 1) The 3 buttons will begin flashing Red along with the flow rate setting on the LCD screen.



- 2) The flow rate setting on the screen will drop to display the highest flow rate that can be achieved.



- 3) The flow rate will stabilise and the buttons will turn green to show the flow rate has set.



Maintenance

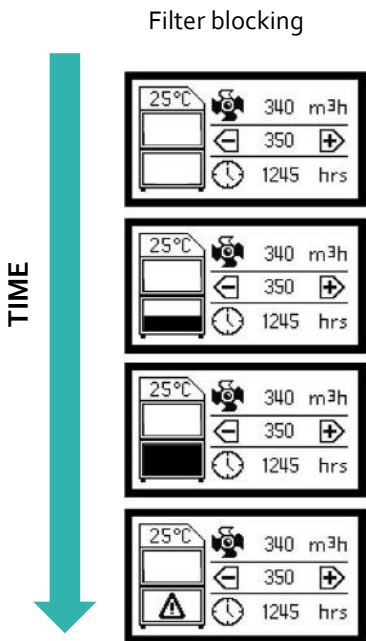


Maintenance General

User maintenance is limited to cleaning the unit and filter replacement, only the manufacturers trained maintenance technicians are authorised to carry out component testing and replacement. Unauthorised work or the use of unauthorised replacement filters may result in a potentially dangerous situation and/or damage to the extractor unit and will invalidate the manufacturer’s warranty.

Replacing Filters

The AD 400 system constantly monitors the condition of the filter. As the filter blocks the LCD display will show the filter symbol filling up. (see section 1 for the LCD details). The filter symbol fills up in 5% increments, when the filter icon is filled the filter will need replacing.



A log of the changes should be maintained by the user. The filters require attention when the display shows the filter blocked icon/ filter output signal or when the extractor no longer removes fume efficiently.

It is recommended that a spare set of filters are kept on site to avoid prolonged unit unavailability. Part numbers for replacement filters can be found on the filters fitted in your system.

To prevent overheating, units should not be run with a blocked filter condition, or with dust obstruction of Inlets / Outlets.

75% filter blocked indication

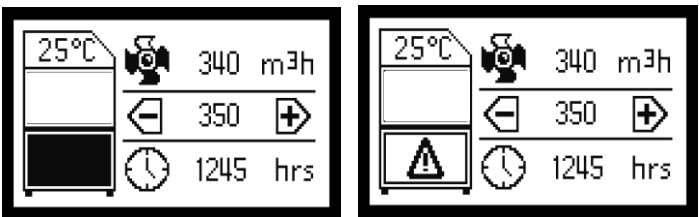
When the filters become 75% blocked the buttons on the front of the extraction unit will turn from Green to Amber and if fitted the iQ system will output a signal to indicate this. At this time it is recommended spare filters are available as a change may be needed shortly.

iQ configuration due to single filter use

As the AM400 is a single filter machine. The iQ system has been modified to run with a single filter, but the GUI remains the same to our other extractors. The Combined filter image (upper filter) will remain ‘empty’ regardless of use. This is because the pressure sensor detecting the filter blockage has been bypassed. Only the lower filter image (pre-filter by other unit terminology) will fill over time. This indicates the blockage of the AM400 filter within the housing.

Filter Replacement

The filter needs replacing when the display flashes between the 2 images shown below, at this point the buttons will glow Red and if fitted the filter blocked signal will be given.



Maintenance

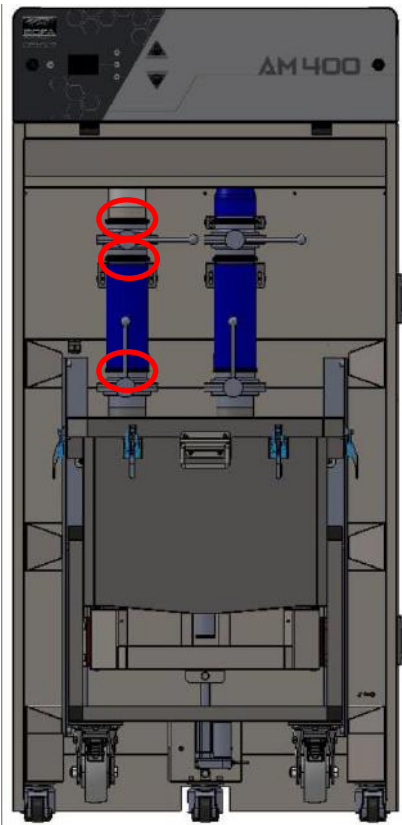
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Cleaning the unit

The external powder coat finished unit can be cleaned with a damp cloth and non-aggressive detergent, do not use an abrasive cleaning product as this will damage the finish.

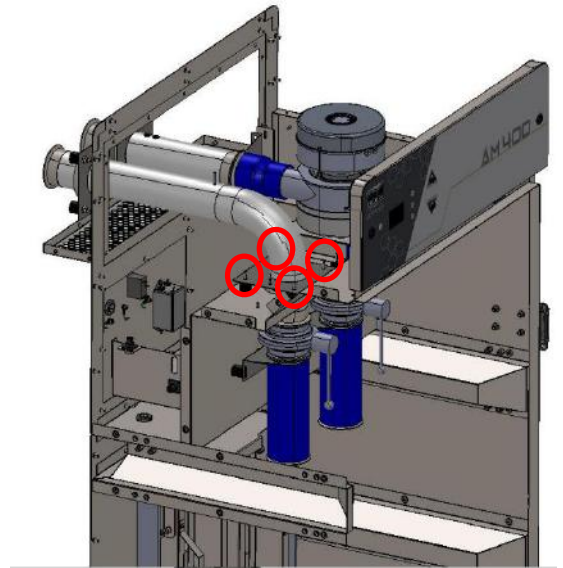
In the unlikely instance the internal inlet path may need to be cleaned, the following procedure outlines how to disassemble the pipework. Before disassembling ensure the extractor has been isolated from all power sources, and PPE as per your companies risk assessment is being used.

- Open the front door of the extraction unit and remove the three tri clamps as indicated below:

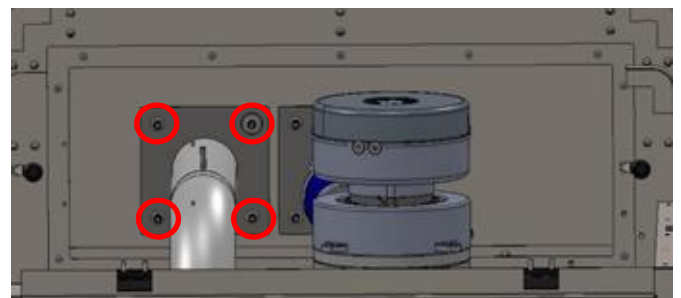


- The machine isolation valve is now removeable to be able to clean this part.

- Remove the 4x M6 bolts as indicated below to remove the elbow from the inlet path.



- To remove the final section in the inlet path, remove the 4x m6 bolts as indicated below, access to this is best achieved through the top access panel by using the two panel key points.



Maintenance

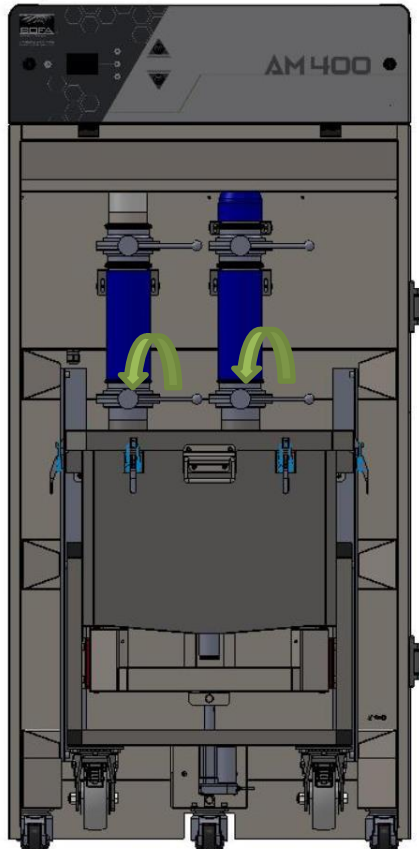
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02

Changing the filter

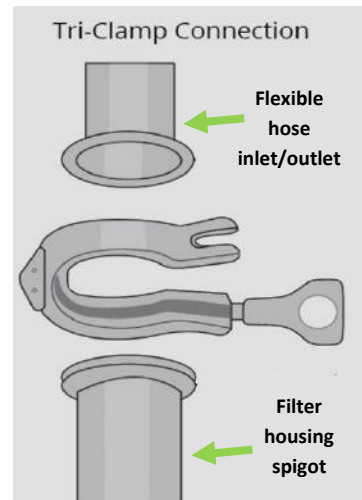
Step 1:

- Ensure the system is powered off and isolated.
- Close both isolation valves by rotating both handles 90 degrees anti-clockwise, ensuring the handle has "clicked" into position and can no longer be moved out of position.



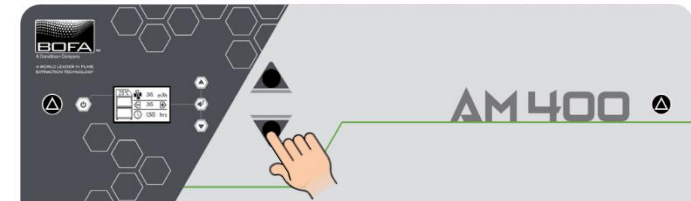
Step 2:

- Remove the lower tri-clamps. between the filter housing and flexible hose.



Step 3:

- Lower the housing to floor via the lift mechanism, by holding the button as illustrated below.

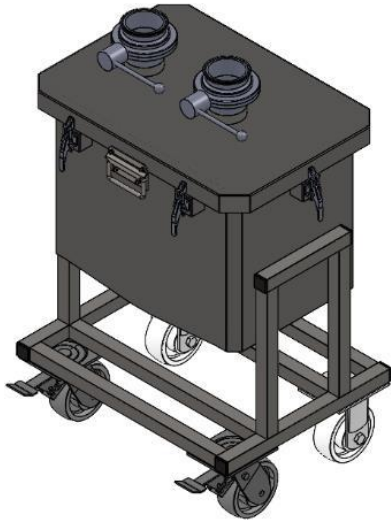


Maintenance

6₀₂

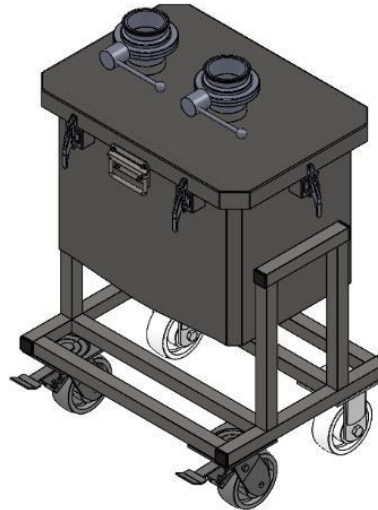
Step 4a:

- If the process being filtered **DOES** require passivation, ensure your company's risk assessment and PPE protocols for this activity are being adhered to.
- Take the enclosed filter housing to allocated "passivation area" and follow your company's passivation guidelines and protocols to open and passivate the filter.



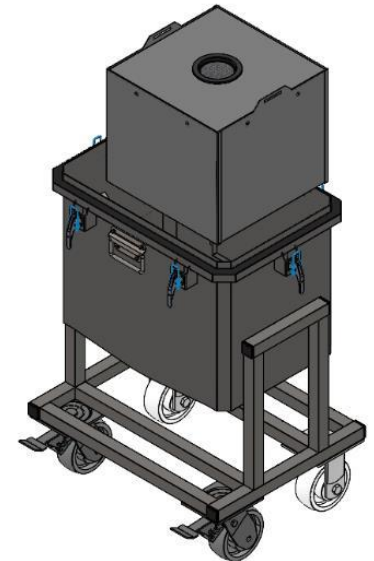
Step 4b:

- If the process being filtered **DOES NOT** require passivation, ensure the correct PPE is being used as per your company's risk assessment on filter change, and then follow from step 5 onwards.



Step 5:

- Remove the lid of the filter housing by unclipping the 6x latches.
- Remove the filter from the housing and dispose of the filter as per company/local and national regulations.

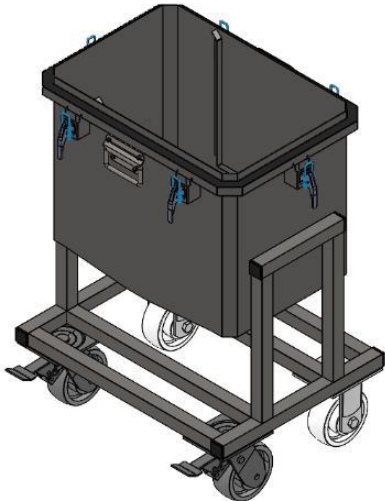


Maintenance

6₀₂

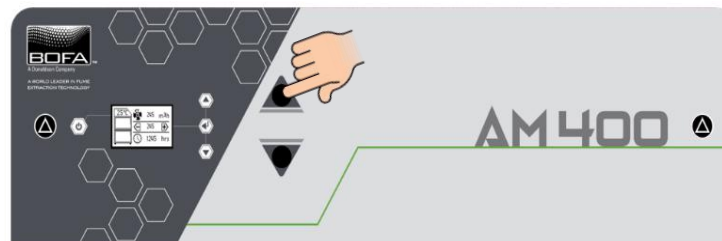
Step 6:

- Clean the housing and install the new filter.
- Secure the lid using the 6x latches.

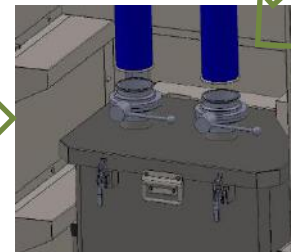


Step 7:

- Push the filter housing back onto the lifting mechanism.
- Raise the filter housing back into place whilst aligning the flexible hose with the spigots on the filter housing.
- Once in place reattach the tri clamps between the filter housing and flexible hose.

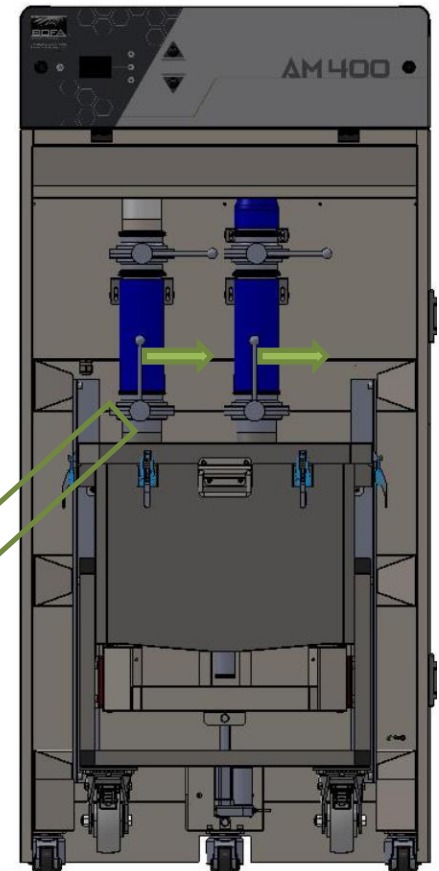


Care point – when locating the filter housing back into the extraction unit ensure the EPDM seals are correctly located into the valves to create a seal, and the flexible hose is correctly aligned into the valves whilst raising the filter housing into place.



Step 8:

- Re open both isolation valves by rotating both of the isolation valves 90 degrees to the right, ensuring the handle has "clicked" into position and can no longer be moved out of position.

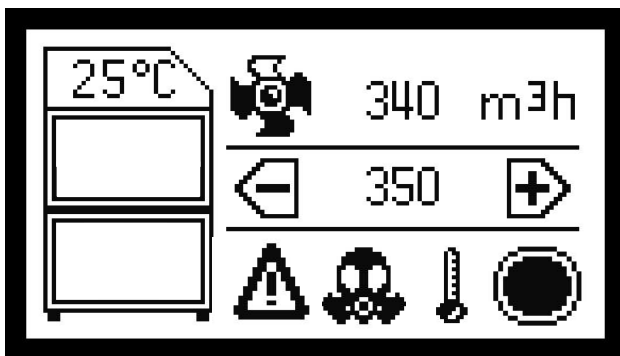


iQ System Display



iQ Display Features

The iQ display has the ability to display all the faults associated with your extraction unit. The image below shows an example of some of the fault icons that may appear in the alarm window of the LCD display.

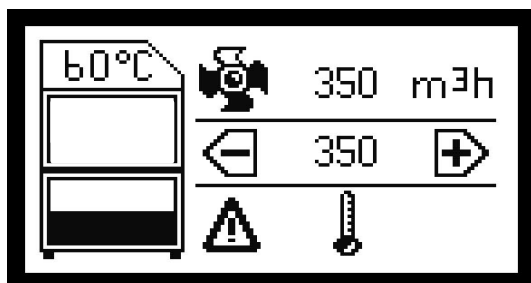


Visual Alarms on the iQ system

The iQ system can visually display a range of alarms on its LCD panel. The visual displays, meanings and solutions are detailed below. All alarms will trigger the system alarm interface output signal and the inbuilt audible buzzer, if fitted/ activated.

Over Temperature Alarm

If the iQ system detects an internal temperature greater than 60°C then it will automatically shut down the extractor to prevent damage to components within the extractor.



Once the internal temperature has dropped by 5°C the extraction unit will be able to restart. To restart the extractor after an over temperature, alarm the unit needs to be placed in Standby mode then powered on again.

Hose blocked alarm

The iQ system features a 2 stage Hose blocked alarm.

- Partial hose blockage
- Full hose blockage

Partial hose blocked alarm

This alarm will become active when the iQ system detects a part blockage in the installation. The iQ system interprets a partial blockage as a vacuum spike within the ductwork but is only a partial blockage as the extractor is still able to maintain its set flow rate.

During this time it is normal to hear the motor increase in speed. The blockage will need to remain in the ductwork for over 5 seconds before the alarm is given.



Full hose blockage

This alarm will become active when the iQ system detects a full blockage in the installation. The iQ system interprets a full blockage as a vacuum spike within the ductwork and is considered a full blocked as the extractor cannot maintain the set flow rate with the blockage present.

During this time it is normal to hear the motor increase in speed. The blockage will need to remain in the ductwork for over 5 seconds before the alarm is given.



iQ System Display



USB Connectivity

The iQ system is equipped with a USB drive, that operates as a 2 way device, as detailed below.

- Duplicating iQ settings
- Download iQ Data

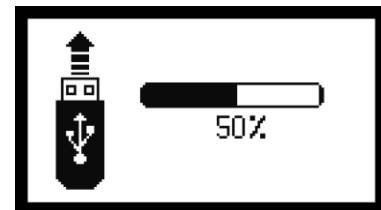
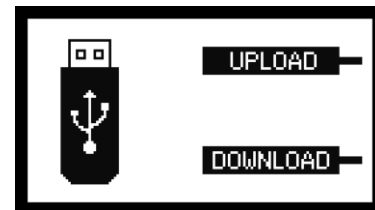
Duplicating iQ settings (USB Upload)

This USB upload feature has been designed for customers that have multiple extractors and specific set of parameters that they wish to duplicate across their iQ extraction units. The Procedure for duplicating extractor settings is detailed below.

1. Obtain the memory stick file from the seller (if specification has been pre-arranged with the seller) Or download original settings from your master iQ unit) (**Max capacity USB Stick 4GB**)
2. Download this file to a blank memory stick
3. Place the iQ system in standby mode (Front power button glowing Red)
4. Remove the front top panel from the AM400 to reveal the USB port on the rear of the panel. Insert the USB.
5. The LCD display will show "upload" press the button corresponding to this
6. The display will show a progress complete bar and when finished a completion "Tick"
7. The USB stick can now be removed from the unit, the panel replaced and the extractor turned back On



If the USB upload procedure fails the screen will display the symbol shown adjacent.



iQ System Display



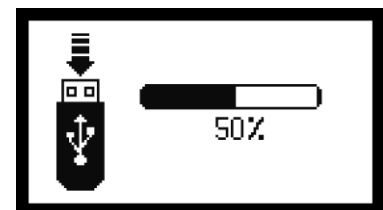
Download iQ Data (USB Download)

With this feature the customer is able to download all stored data within the iQ system, this information can then be used to keep records of how your iQ system is performing, this is also very beneficial for the technical team when diagnosing issues with the extraction system. The following list shows the information available within the event log.

Downloading iQ Data

To download the information from the iQ system please follow the procedure below.

1. Obtain a memory stick (**Max capacity USB Stick 4GB**)
2. Place the iQ system in standby mode (Front power button glowing Red)
3. Remove the front top panel from the AM400 to reveal the USB port on the rear of the panel. Insert the USB.
4. The LCD display will show "download" press the button corresponding to this
5. The display will show a progress complete bar and when finished a completion "Tick"
6. The USB stick can now be removed from the unit, the panel replaced and the extractor turned back On



If the USB upload procedure fails the screen will display the symbol shown adjacent.

iQ System Display



The iQ system will take a snapshot of the system performance every 15 minutes or if a system adjustment is made or an alarm is triggered.

Some of the information captured is listed below..

- **Date**
- **Time**
- **Flow rate**
- **Flow rate Set point**
- **Pre filter % blocked**
- **Inlet % (installation restriction)**
- **Motor output**
- **Internal Temperature**
- **Hours run**
- **Alarms**
- **Faults**

Date & Time

The date and time will be set as part of the testing stage with the manufacturer and set to GMT.

Flow rate

This column shows the real time flow rate through the extractor.

Flow rate set point

Shows the target flow rate that has been set by the user, this will record every time an adjustment is made.

Pre filter % blocked

The display on the extractor will show the pre filter blocking in 5% increments, but with this downloadable file the pre filter blockage is shown as an exact percentage of its full capacity.

Inlet % (installation restriction)

Shows the percentage of the iQ system capacity that is taken up by the installation (pipe work) this value would also rise if the inlet or pipe work becomes blocked.

Motor output

Shows the percentage the motor is being run at to achieve the flow rate set by the user. This value will increase as the filters begin to block.

Internal temperature

Shows the internal temperature of the extraction unit, the sensor is mounted to the main PCB when this sensor reaches 60°C it will shut down the extractor and a log will be recorded.

Hours Run

This is a simple hours run counter that will begin from the first time the extraction is switched on by the user. The hours run counter will only be activated when the motor is running.

Alarms

When the iQ system has an issue that requires the user to act upon this is classed as an alarm, when this occurs a code will appear in this column, the main alarm codes are listed below.

Code	Meaning
1	Door Open
4	VOC alarm
16	Over temperature
32	Inlet partially blocked
64	Inlet fully blocked
512	Motor failure
2048	System 100% blocked
8192	Pre filter blocked
524288	System 75% blocked

Faults

This column will display a code if a fault with the iQ system is detected, for analysis of any faults in this column please contact the BOFA helpline.

Troubleshooting



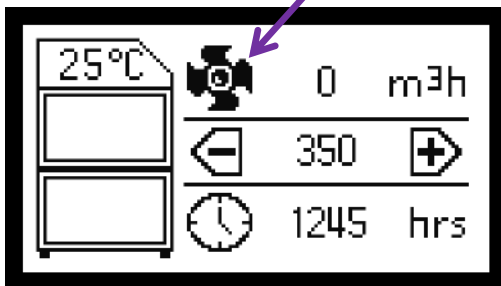
Fault Indication

The iQ system intelligently monitors the whole extraction unit. In the unlikely event of a problem with the extraction unit please read this section of the manual before contacting the helpline.

This section contains details on all faults the iQ system is able to display, these faults are detailed below.

Motor Failure

If the extraction unit develops a fault relating to the motor then the motor icon on the display will stop rotating and flash the flow rate will read 0 m³/h.



If the above symbol is displayed power should be isolated from the extractor and arrangements should be made to replace the motor.

Internal Power Supply

The extractor is fitted with an internal transformer that outputs 12V DC providing the iQ system with power.

If the buttons on the front panel are not illuminated or operational this would indicate a problem with the internal power supply (provided the main isolation switch is in the ON position and voltage is proven at this point)

If the internal power supply has failed then, arrangements should be made to replace the transformer.

Error Codes on the iQ display

The iQ system is able to self-diagnose problems relating directly to the monitoring system. Faults are displayed as a number in the error window within the display.



In the event of an error code being displayed please contact your local representative or BOFA who will be able to diagnose the fault and advise on the most efficient solution.

USB diagnosis

For a "Real time" event log of any faults with your iQ system please see section 7.04 & 7.05 to download a full analysis of the extraction system.

Replacement Parts



Consumable Spares

The AM 400 contains a particulate filter. This should be replaced when instructed to do so by the iQ system (see section 6 for replacing the filters).

To maintain performance it is important that the filters are replaced with identical BOFA filters. To re-order please refer to the Filter number printed on the filter installed in your extraction unit.

Maintenance Protocol

The iQ data logging function enables the retrieval of filter change intervals. Users may also wish to record changes on the table below.

Unit Serial Number:	
Filter	
Date	Engineer

Filter disposal

The filters are manufactured from non-toxic materials. Filters are not re-usable, cleaning used filters is not recommended. The method of disposal of the used filters depends on the material deposited on them.

For your guidance

Deposit	EWC Listing*	Comment
Non Hazardous	15 02 03	Can be disposed of as non-hazardous waste.
Hazardous	15 02 02M	The type of hazard needs to be identified and the associated risks defined. The thresholds for these risks can then be compared with the amount of material in the filters to see if they fall into the hazardous category, if so, the filters will need to be disposed of in line with the local/national regulations.

*European Waste Catalogue

System Specifications



Unit: **AM400**

Capacity: 330m³/h
Weight: 192Kg
Motor: Centrifugal Fan
Electrical supply: 115V or 230V
Hertz: 50 or 60Hz
Full Load Current: 13.8A at 115V / **TBC at 230V**
Noise Level: Below 80dB (A)
(at typical operating speed)

Size:

	Metric (mm)
Height	1670
Depth	857
Width	789.5

Filters:

Filter Type	Surface area	Efficiency
F8	13.2m²	95% @ 0.9micron
H14	13.2m²	99.997% @ 0.3micron

Environmental operating range:

Temperature: +5°C to + 40°C
Humidity: Max 80% RH up to 31°C
Max 50% RH at 40°C

.Contact Information

BOFA Headquarters

21-22 Balena Close

Creekmoor industrial Estate

Poole

Dorset

BH17 7DX

UK

Phone: +44 (0) 1202 699444

BOFA Americas

303 S.Madison Street

Staunton

Illinois

62088

USA

Phone: 001 (618) 205-5007