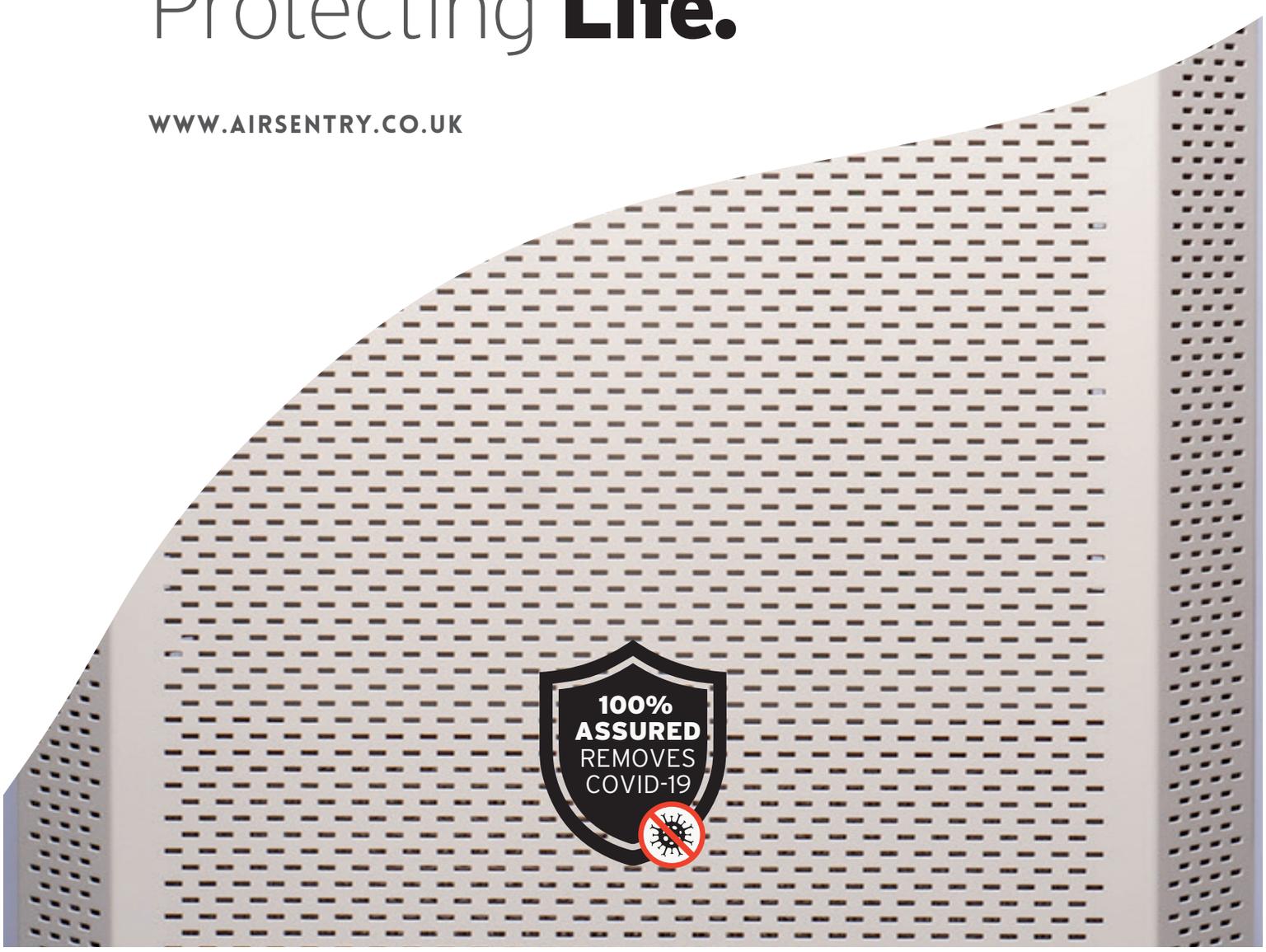
Air Sentry

Protecting **Patients,**
Protecting **Staff,**
Protecting **Life.**

WWW.AIRSENTRY.CO.UK



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WHAT IS AIR SENTRY?

Air Sentry® is a British invention. It is an air management system that will significantly improve the indoor air quality in any building. It achieves this using air so pure it is deemed Ultra Clean®.

Air Sentry® is a quick, easy and cost effective method of reducing all airborne risks to health, **including coronavirus.**

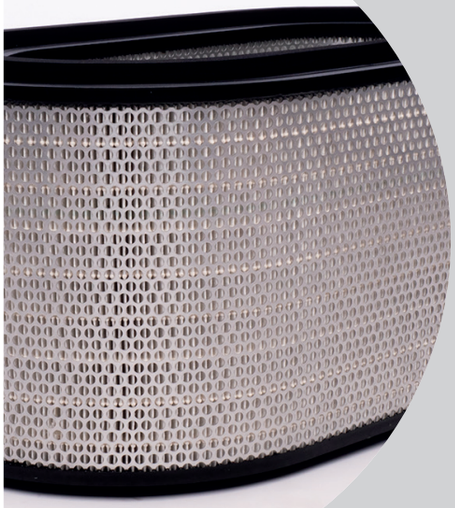
Significantly better air quality is achieved than other systems currently in use in many health care areas. **Air scrubbers and purifiers are far less effective than our whole room Ultra Clean® ventilation system.**

More than 2,000 GP practices and 200 hospitals are in areas affected by toxic air

Source: British Lung Foundation (2018)

Air Sentry's Modular system is HTM 03.01 compliant & can be tailored per client specification.

Our modular Air Sentry® system was developed alongside the NHS to ensure exceptional levels of air hygiene, low cost deployment and compliance with existing UK health care regulations, (HTM 03.01).

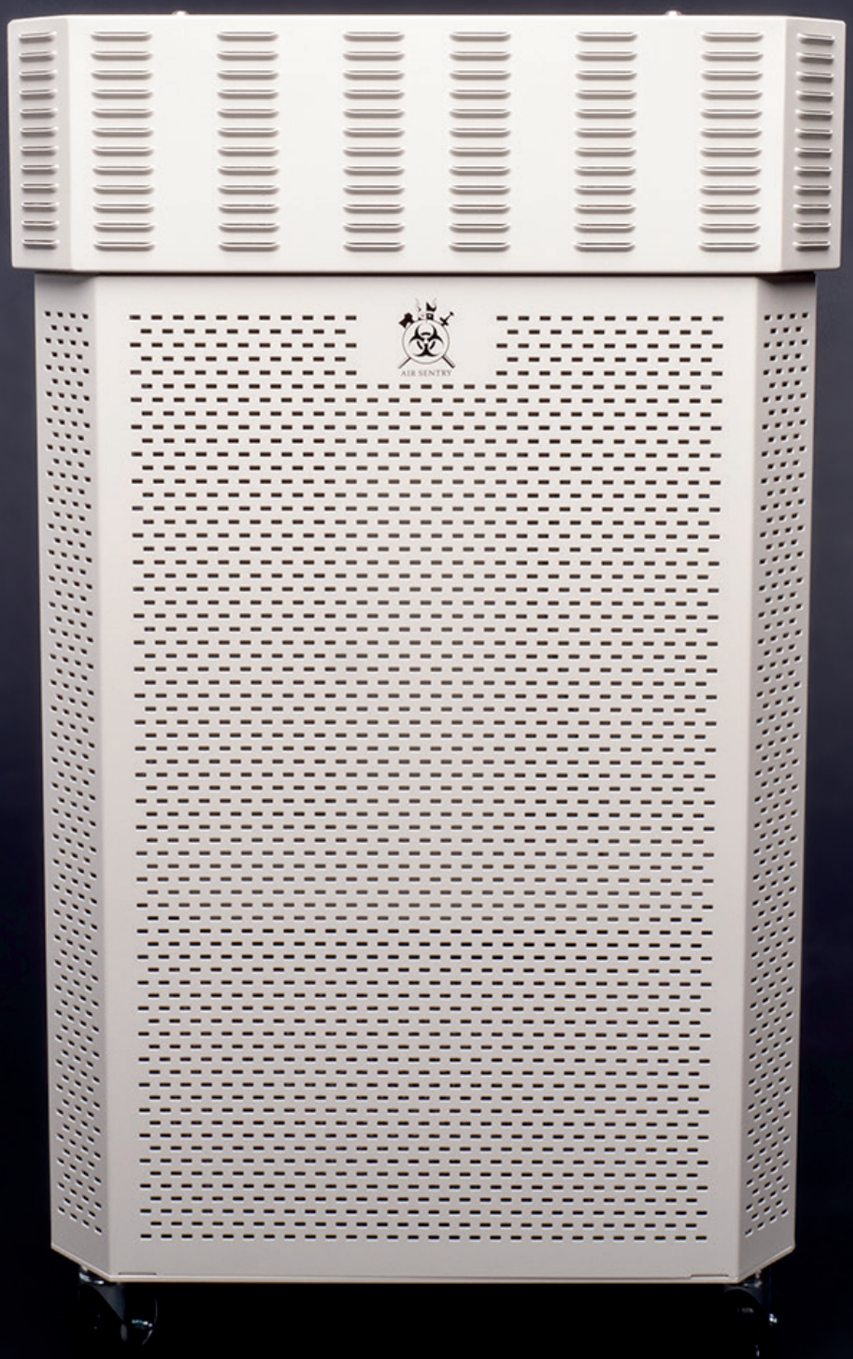


Air Sentry® is specifically designed for health care needs but can offer benefits in other sectors, including recreation, education and industry. Air Sentry® is effective against asbestos dust, sick building syndrome and in reducing air pollution in buildings - an increasing cause of breathing difficulties and preventable deaths.

Clients can maximise their investment by easily configuring and reconfiguring the **Air Sentry® modular system** to meet any change in needs. It fits together much like the child toys Meccano™ or Lego™ and can be linked to an existing HVAC system.

With a design life of over 25 years, flexibility has become the watchword of the Air Sentry system.

Our wall mounted system can be easily altered to become a mobile system. Similarly, our mobile system can become fixed or changed into a wall mounted system. This is usually achievable on-site in the UK and future export clients will be offered the same capability.



More than 2,000 health centres in Great Britain, including major teaching hospitals, children's hospitals, clinics and GP surgeries are in areas which exceed safe air pollution limits.[1]

Source:British Lung Foundation (2018)

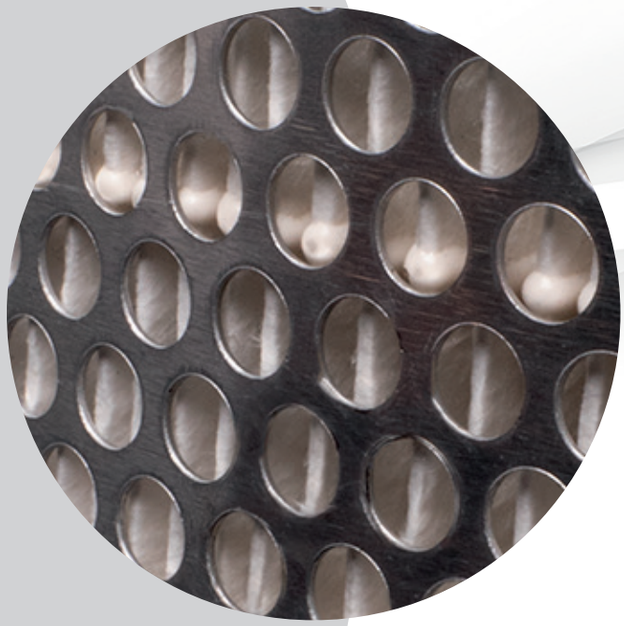
1. Tested by Pathogen Control Research Group, School of Civil Engineering, University of Leeds.

ABOUT US

Air Sentry® was founded in 2000 by Andrew Carnegie with the goal of protecting staff and patients from air transmitted or transported diseases and pollutants.

Andrew has a background in life support, as well as clinical engineering, gained from both the R.A.M.C and NHS. Prior to Air Sentry® he had specialised in ITU and OR solutions as the director of Kreuzer overhead pendants, now part of Hill Rom.

Air Sentry® was initially developed with support from Newham NHS Trust, Ealing NHS Trust London and the Royal Belfast Hospital for Sick Children. The first system passed evaluation in 2007. HTM 03 compliance was achieved in 2009.



THE SYSTEM IS EFFECTIVE AGAINST ALL AIRBORNE PATHOGENS...

...including TB, aspergillosis, measles, flu and coronavirus, all of which are safely broken down in the filter.

In 2009, staff in a major hospital treating swine flu patients, were contracting the disease in their isolation facility. The facility was negatively pressured and staff had full PPE including FFP3 masks and full covering.

An early version of Air Sentry® was installed and staff infection rates ceased. No further staff infections occurred even after PPE use was relaxed to wearing only barrier masks. The noted improvement in staff morale due to having Air Sentry® installed was a welcome side affect.

The first Air Sentry® mobile unit went into use in Belfast in 2014.

Both mobile and fixed systems are available to combat any future air transmitted or transported disease.

Client hospitals using the system have been better prepared than others to cope with the ongoing coronavirus pandemic.

Air Sentry® is used in some ICU and OR areas as the sole air handling system. Both fixed and mobile systems offer protection from coronavirus (sars_cov_2).

AIR SENTRY OFFERS:

1. **Exceptional air biosecurity,** particularly around aerosol generating medical interventions such as CPAP
2. Modules for both **positive and negative pressure**
3. Combined with PPE and good infection control, **staff risk reduces to near zero**
4. **Robust 24/7 operation**
5. **Ease of maintenance**
6. **Low purchase costs** over traditional approaches
7. **Significant savings** on operational costs
8. **Faster patient throughput** due to reduced dwell times
9. **Ability to supplement existing installations** without compromising their operation

HOW DOES AIR SENTRY WORK?

The image below depicts flow in an ICU room area, based on zero pressure room data using computational fluid dynamics. Air Sentry® can be placed on any wall position away from the patient area.

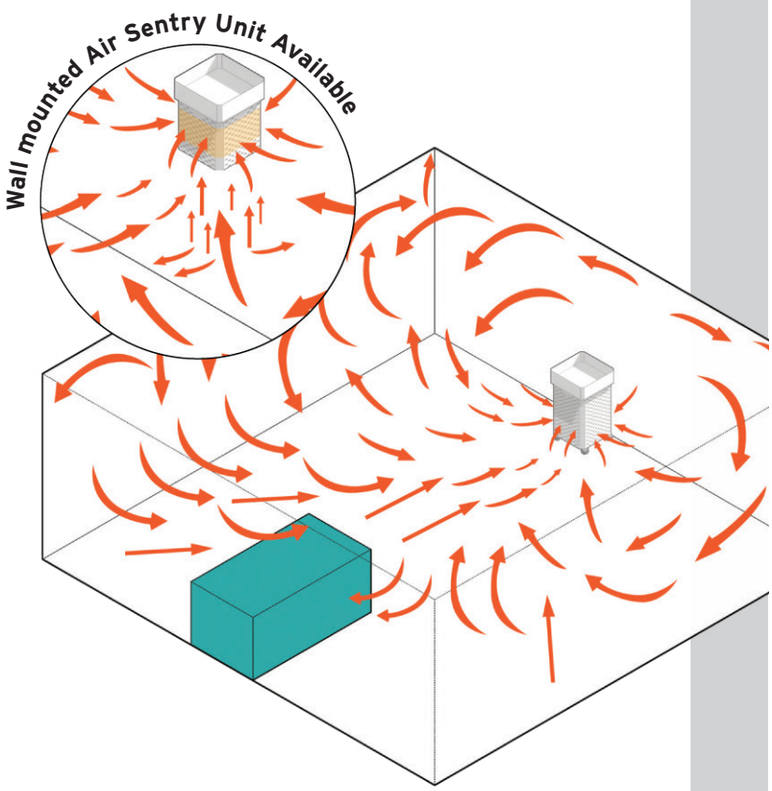
This slow moving flow 'pulls' air from the entire room, including corner areas, which are a problem for existing approaches, especially where ventilation inlets and outlets are solely ceiling mounted.

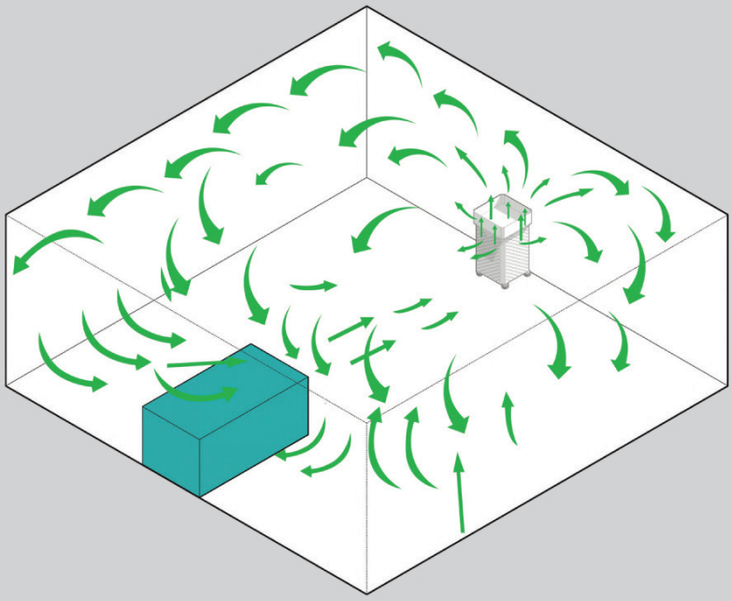
This system can work independently or be used alongside any existing system to enhance biosecurity.

Our wall-mounted system has successfully supplemented an older, non-compliant OR system that has subsequently exceeded air quality requirements since 2010.

The slow moving flow occurs throughout the entire room, including corners. Surface depositing is significantly reduced. Ultra Clean® air; near sterile, exits the system and rotates upwards to form a return path. This pushes the ultra clean air over the patient area from a high level, creating an extreme level of mixing and air dilution.

This completes the cycle, which is continuous. The unique rotational flow from Air Sentry®, combined with our purpose designed cartridge filtration system, results in an ICU room achieving Ultra Clean® status within 10 minutes; this being maintained within 30 minutes of running, 24/7.





The flow from the Air Sentry® system forms a rotational motion within the slow moving air stream, throughout the entire room.

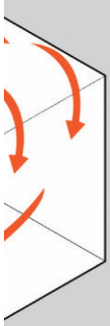
This creates a significant level of mixing within the room environment, maximising dilution. Dilution is the rationale behind all healthcare ventilation systems used for infection control.

The unique design of Air Sentry® means that our system exceeds actual air change requirements.

In an ICU room, the dilution effect is equivalent to around sixty air changes per hour, without the noise or wind that would be required to achieve this conventionally. The majority of rooms are maintained at ISO EN Level 7, significantly cleaner than 'normal' hospital air.

Air Sentry® can also be supplied as a fixed system; we can offer a positive or negative pressure module, while our system can adapt to accept temperature managed air from existing systems and can be used without affecting any existing hospital ventilation system.

In areas with open windows, Air Sentry® can significantly reduce the risk of airborne pathogens such as Aspergillus. We have also tested our systems against MRSA and C.Diff. Air Sentry will also maintain an Ultra Clean® air environment for Sars_Cov_2 and is currently being widely deployed in hospitals to help protect against Coronavirus.



NOTTINGHAM UNIVERSITY HOSPITAL 2020

Tests were undertaken in two areas.

Room A was in the biomedical research facility which had no current clinical use. There was no ventilation system operating in this room.

Room B, an endoscopy area, had been unable to be used due to having a ventilation rate that was too low to offer protection from aerosol generating procedures.

Equipment Used
Air Sentry Mobile System
AeroTrak™ laboratory grade particle counter
1µm particle generating tubes with visual smoke

Staff Involved
Bio-medical scientist, Bio-medical physicist, Endoscopy surgeon (senior consultant), Endoscopy surgeon (consultant), Air Sentry representative, medical and surgical staff in support of list (4 patients).

Procedure
Initial assessment tests were made in Room A and the results logged. The Air Sentry system was then initiated and run on maximum for 30 minutes as per our recommendations. Continuous monitoring took place during this period. After 30 minutes the Air Sentry unit's performance was dropped to normal running.

After a successful assessment in the biomedical research facility the unit was moved to the endoscopy operating suite where a list of four patients was undertaken involving aerosol generating procedures.

Results

Room	Area	Vol	0 min	0 min	0min	10 min	10 min	10 min	30 min	30 min	30 min
			0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm
A	15	40	10m	6m	3m	5m	500K	200K	1.5m	38K	300
B	18	54	12m	7m	5m	4m	655K	375K	1.88m	50K	500

ISO En14644: Part 1: 2015 Clean Room Classification

Room	0.5 µm	1 µm	5 µm
ISO 6	35,200	8,320	293
ISO 7	352,000	83,200	2,930
ISO 8	3,520,000	832,000	29,300
ISO 9	35,200,000	8,320,000	293,000

Smoke Dissipation

Room	Area M2	Vol M3	Approx. Removal Time	Observations
A	15	40	3 Secs	Pulled down
B	18	54	2 Secs	Pulled down

Conclusion

Initial testing in Room A showed exceptional performance by the Air Sentry unit. The system rapidly took the room air to being ultra clean ISO level 7 during use. Smoke testing using a 1µm oil showed rapid dispersal with the air being pulled down, away from faces. On this basis it was deemed safe to continue the testing with the endoscopy list in room B.

Room B testing was undertaken with four staff members and a patient present. A total of four patients were operated upon. It had not been deemed safe to undertake aerosol generating procedures previously in this area due to the pandemic.

The Air Sentry unit was operated for 30 minutes before the list commenced. The system took the room air to ultra clean rapidly and maintained this level during the procedure. Smoke dispersal testing was undertaken between patients. Results showed rapid dispersal and an air current that pulled the aerosol plume downwards, away from faces.

Two hundred Air Sentry® units across two hospital sites have since been implemented by this client as part of their coronavirus response. Areas covered include the emergency department, covid assessment wards, endoscopy, ENT, lung function department, respiratory wards, dental departments, care of the elderly and cardiology.

EALING HOSPITAL 2014

An ITU within an existing building with restricted space.

An existing ITU area consisting of 5 rooms with switchable pressure differential.
A wall mounted Air Sentry was used to upgrade the air handling in 3 of the bays.

A further four bays in a step down area, fully enclosed opposite a four bay recovery area.

Equipment Used
Air Sentry® fixed system
Met One™ laboratory grade particle counter
1µm particle electric smoke generator

Staff Involved
Estates
Air Sentry
ICU consultant
Lead Nurse
Infection control

Procedure
Testing was undertaken with no ventilation running, and subsequently with the units operating in support. Further testing was undertaken by infection control and then post occupancy.

Results

Room	Area	Vol	0 min	0 min	0min	10 min	10 min	10 min	30 min	30 min	30 min
			0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm
ICU1	30	90	9.1m	4m	350K	2.5m	300K	560	350K	50K	8K
ICU2	30	90	9.2m	4m	500K	1.8m	300K	700	300K	30K	8K
ICU3	30	90	9.2m	4.1m	400K	1.9m	300K	645	310K	50K	8K
ICU4	22	67	10.35m	6.2m	550K	2.5m	460K	901	340K	40K	7K
ICU5	22	67	9.8m	5.9m	600K	2.5m	440K	910	340K	50K	7K
ICU6	22	67	9.8m	6.1m	550K	2.6m	450K	897	330K	40K	7K
ICU7	22	67	9.9m	6.1m	550K	2.5m	450K	906	340K	40K	7K

ISO En14644: Part 1: 2015 Clean Room Classification

Room	0.5 µm	1 µm	5 µm
ISO 6	35,200	8,320	293
ISO 7	352,000	83,200	2,930
ISO 8	3,520,000	832,000	29,300
ISO 9	35,200,000	8,320,000	293,000

Smoke Dissipation

Room	Area M2	Vol M3	Approx. Removal Time	Observations
ICU1	30	90	2 Secs	Pulled down
ICU2	30	90	1 Secs	Pulled down
ICU3	22	67	2 Secs	Pulled down

Conclusion

Air quality in this NHS ICU consistently exceeds current standards.

In the six years since installation there have been zero instances of hospital acquired infections noted by the ICU team who report that having the system operating appears to have significantly improved staff morale around coronavirus.

EALING HOSPITAL 2014

Update: 9th January 2021

The step down and recovery area had been transformed into an 8 bedded cohort area for covid-19 patients. Testing showed the following results.

Room	Area	Vol	0 min	0 min	0min	10 min	10 min	10 min	30 min	30 min	30 min
			0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm	0.5 µm	1 µm	> 1 µm
ICU0	30	90	5.60m	700K	29K	n/a	n/a	n/a	n/a	n/a	n/a
ICU Nurse	100	250	4.17m	531K	29K	1.8m	300K	700	2.49m	279K	10K
Covid CPAP	150	450	2.49m	230K	9K	n/a	n/a	n/a	n/a	n/a	n/a

1µm aerosol testing showed rapid dilution, less than 1 sec, with the plume being pulled down away from faces.

Conclusion

The air in the area utilising aerosol generating support (CPAP) had a 50% lower particle count than the nursing area in the next door ICU.

FAQ'S

How long is the filter life?

The expected lifespan of the filter is **24 months** with normal use.

How often should my system be serviced?

Annual service is recommended.

Servicing is undertaken directly in England and Wales. In other areas we have agents trained by our team to complete servicing.

We undertake particle counts and 1µm aerosol dilution testing after each service.

What is EN14644 part 3?

It is the **highest grade filtration test for cartridge filters**, as used by the nuclear industry.

EN1822 graded filters are batch tested so we use En1822 media but then test every filter individually to ensure they are 100% compliant.

Our filter has a final grading of H14, the same filter can be supplied graded to U15. We use the best approach feasible and then do this to reduce cost.

What is the average delivery time?

Normally **4 weeks** from order FOB.

What voltage does the system run on?

The system runs on **230v or 100 to 130v**.

Is the system easy to operate?

Yes – just position it away from the patient's bed and switch on.

Do you offer support?

Yes – in person, online and over the phone.

Is the system CE marked?

Yes – each unit individually CE certified and comes with its own certification in the rear of the manual. We also supply bespoke systems which can be client specified.

Will Air Sentry® remove Sars-Cov-2?

Yes - our system removes 100% of all known pathogens transported via the air.

How much power does the system use?

Around **70-150w**; similar to a light bulb.

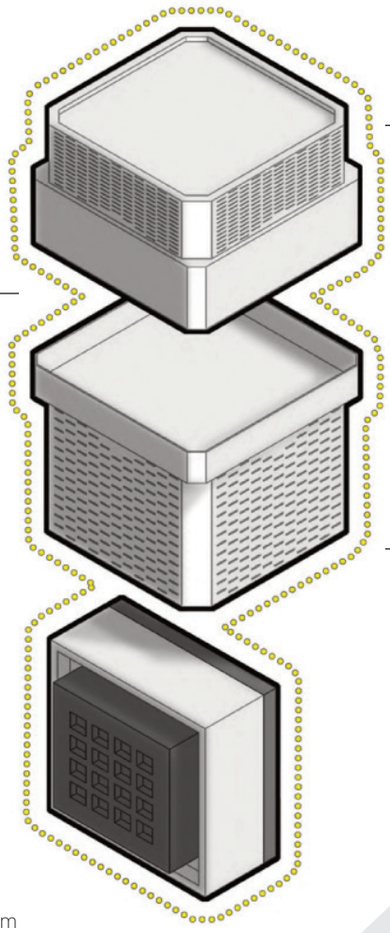
How long is the warranty?

We offer a **12-month warranty**, but we haven't had a single failure since 2003.

AIR SENTRY INTERCONNECTED SYSTEM

All systems come with our own onboard management system with user interface, monitoring and alarms.

We can supply simplified systems for use under BMS control or interface our system to BMS on a bespoke basis.



Main Module

- Can be fixed or mobile
- Unique ULPA based cartridge filter
- Removes all pathogens and pollutants
- Low profile
- Can be floor, wall or ceiling supported

Positive Pressure Module

- Can be stacked to increase output
- Used to protect patient from disease eternal to the room ie small OR or ICU
- Independent filter system

Fresh Air Supply/HVAC Interface

- All systems can be supplied with interface for supplied fresh or temperature managed air.

Negative Pressure Module

- Multi outlet ports for flexibility
- ICU - CPAP Cohort
- Independent Filter system
- Wall system replaces wall mounting
- Mobile unit (becomes static) - within housing
- Used to protect others from disease in the room

Please note that fully populated modular systems have longer supply times than our standard units.

TECHNICAL DATA

Description	Fixed	Mobile
Size (mm)	590(l)x390(w)x420(h)	590(l)x390(w)x1050(h)
Casing	Steel - powder coated	Steel - powder coated
Air Inlet	300 degrees	300 degrees
Air Outlet	360 degrees	360 degrees
Pre Filter Inlet Port	Yes	Yes
Post Filter Inlet Port	Yes	Yes
Power	30-150W	30-150W
Frequency	50/60Hz	50/60Hz
Voltage	230V	230V
Motor	Reverse curve continuous	Reverse curve continuous
Max Fan Flow 230/110	1400M3/hr / 1200M3/hr	1400M3/hr / 1200M3/hr
Total Air Change Rate Equivalent	2800M3/Hr	2800M3/Hr
CADR 230/110v	min – 1440M3/hr / 1,200M3/hr max – 4,200M3/hr / 3,300M3/hr	min – 1440M3/hr / 1,200M3/hr max – 4,200M3/hr / 3,300M3/hr
Max Fan Flow with modules 230/110v	Solo – 2800M3/hr/ 2400M3/hr Full – 4,200M3/hr / 3,600M3/hr	Solo – 2800M3/hr/ 2400M3/hr Full – 4,200M3/hr / 3,600M3/hr (note the mobile unit becomes fixed floor supported with positive pressure)
Filter Type	Cartridge	Cartridge
Initial Grade	G0	G0
Pre Filter	F9	F9
Filter	Activated Carbon	Activated Carbon
Main Grade	U15 / H14	U15 / H14
Final Filter (structural)	G0	G0
Certification	EN1822 / EN14644 part 3	EN1822 / EN14644 part 3
Noise 230v/110v	3 68/58dB	3 68/58dB
Mounting	Wall or Ceiling	Mobile or Floor Fixed

Air Sentry

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