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How to choose the right microbial air sampler

Selecting the right instrument for your environmental monitoring needs

Active air samplers often have to meet very specific requirements. Although priorities differ between users, what to consider usually includes instrument features and properties, the characteristics of the facility, the nature of the products to manufacture and how the sampler will be used in routine operation. The selection criteria can be grouped into five broader categories:

- Technical properties and features
- Cleanroom suitability
- Ease of use
- Data integrity and compliance
- Supplier service and maintenance

This guide subdivides the above into more detailed criteria that you can use to assess your purchasing options.

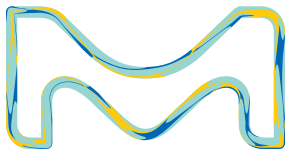
Technical properties and features

Collection efficiency: A microbial air sampler must be validated to demonstrate that it collects viable particles efficiently according to EN 17141 or ISO 14698. This should be performed by a competent external body on behalf of the supplier or manufacturer. The validation method has two parts: physical and biological efficiency. Physical efficiency describes an air sampler's ability to collect particles of various sizes and is defined by the d50 value. Biological efficiency, determined as percent recovery, describes the sampler's ability to capture organisms from the air in a way that these remain viable after impaction. Biological and physical efficiencies are influenced by the impaction speed, which must be high enough to collect small particles but low enough not to harm microorganisms. The better the air sampler is at impacting small particles without significantly impairing the viability of captured organisms, the more reliable your viable air monitoring results will be. While most samplers do well with particles larger than 2 µm in diameter, some struggle with particles smaller than 2 µm, which are extremely important in areas Grade A and B to minimize the risk of false negatives. Buyers should ask suppliers for detailed validation data and compare efficiencies.

Flow rate accuracy: The most critical operating parameters of a viable air sampler are flow rate accuracy and sampling time, which together determine the volume of sampled air. Periodic calibration of these sampling parameters should be traceable to ISO 17025 accredited laboratories, ensuring the validated accuracy of the calibration tools in comparison to standardized references. Advanced samplers feature sophisticated technology such as a mass flow sensor system, which helps to ensure that the flow rate stays at the same steady and repeatable level during sampling at variable temperature and ambient pressure conditions, or components that carry out checks for leaks in the air intake. Check which flow rates the air sampler offers. Most operate at a fixed rate of 100 liters per minute as suggested in EN 17141, while some offer the option to set other values. A flow rate of 200 L/min reduces the sampling time by half, but should be validated for efficiency. Ask your supplier for data. On the other hand low a flow rate might be the perfect choice for continuous active air monitoring.

No-touch sampling start: If you want to move away or even leave the room before sampling starts, the instrument will have to offer either remote or time-delayed starting of the sampling process.

Battery properties: If you operate your active air sampler on battery power, battery capacity and lifespan matter. Determine how many samples the battery can take before recharging and how many charging cycles you can expect from the battery over its lifespan.



Cleanroom suitability

Non-viable particles: It is important to consider that microbial air samplers themselves may emit non-viable particles during sampling—to what extent depends mainly on the operating principle of the blower unit. Different maximum levels of non-viable airborne particles apply to cleanrooms of the various grades, so high emission levels could limit the areas in which the air sampler can be used. The supplier should be able to hand you documentation that sheds light on the sampler's particle emission levels.

Size, weight, robustness: If you need to transfer your microbial air sampler frequently, its portability and weight should be considered. A small footprint is advantageous particularly in sampling environments where space is at a premium. On the other hand, the sampler should stand stably to avoid it being moved—or worse, knocked over—during sampling. Generally speaking, your air sampler will probably serve you longer if it is made of robust materials. Try to find the right balance of these properties for your intended usages.

HEPA filter: Transferring active air samplers from lower to higher grade areas is known to be a significant source of contamination because viable particles may be trapped inside. Any sampler moved to a Grade A area should offer the option to have a particle-retaining HEPA filter mounted to its air outlet. Of course, this filter should not impact the airflow and sampling efficiency.

Non-disturbance of unidirectional air flow: The microbial air sampler itself should also be designed to minimize disruption to unidirectional airflow as required EU GMP Annex 1, something smoke studies can visualize.

Easy sanitization: Cleaning and sanitization ease is a further consideration. Housing materials shall be resistant to a broad range of disinfectants including sporicidal. The overall design should minimize dirt traps and allow easy access for disinfection. Sterilizable components are favorable sampler features, as is the possibility to VHP decontaminate the inner parts of the sampler. The handling of the perforated lids should reduce the risk of cross-contamination.

Ease of use

Convenient handling: To enter settings, state-of-the-art microbial air samplers feature a touchscreen that can be operated conveniently even when wearing gloves. It should be intuitive to use. Ease of use, however, is more than a convenience issue. The more complex it is to operate your air sampler, the more likely handling errors will occur. Human error can lead to a false-negative result and possibly a compromised finished product, or to a false positive result that triggers an unnecessary and costly out-of-specification investigation.

Minimal manual actions: What can help to minimize human errors is a configuration option to limit the actions that operators perform on the air sampler, ideally pressing a single button. A closing mechanism with no need for twisting of the sampler lid reduces manual activities further. Lids are made of stainless steel or aluminum, with some suppliers offering single-use lids that do not require autoclaving. It is worth finding out if the supplier thoroughly quality-checks these lids for their perforations. Clogged or poorly drilled holes can impair air sampling.

Self-check features: Advanced microbial air samplers possess features that reveal a check for leaks or errors such as a missing agar plate or the wrong perforated lid type being used, which further reduces the likelihood of human errors.

Plate-size adaptation: While most air samplers are primarily designed to operate with 90 mm diameter Petri dishes, many offer the option to adapt the plate holder to 55 mm dishes. Size adaptation should be easy to do without using a tool, and plates should be simple to insert and retrieve.

Data integrity and compliance

Data transfer & storage: Data integrity and traceability requirements are constantly on the rise, so it is advisable to think ahead and take this into account when deciding on which air sampler to purchase. If your facility is not yet digitalized, this might change in the coming years. In highly digitalized environments, the smooth transfer of data into a LIMS or a data management system for environmental monitoring may already be a necessary requirement, so the connectivity features of the air sampler must support this. A few instruments allow the sampling data to be scanned in via a result barcode shown on the display or can be transferred via Wi-Fi communication. The exported data should include operator ID, date, time, location, sample volume and Petri dish data.

Supplier service and maintenance

Spectrum of services: Occasionally, your microbial air sampler will need special attention. It must be qualified (IQ, OQ and PQ) before implementation for routine use, and it requires calibration at regular intervals, at least once a year. While some of these tasks are best performed by the user, others are usually sourced to the supplier or to third-party service providers. Find out which services are available. A comprehensive service and support spectrum would include IQ/OQ, maintenance, calibration and technical assistance. It makes sense to set up a plan what is going to be done by whom, when and where.

Calibration: As the task that verifies instrument constants such as flow rate and timer, calibration is crucial for the continued reliable operation of the air sampler, and is performed along with its lids. Some suppliers sell an anemometer with which users can perform calibration themselves. If you outsource calibration, consider whether this will be performed at your facility or whether you have to send in the sampler. In the latter case, find out how long you will have to do without the instrument. Depending on how well or not you pack it, there is also a certain risk of damage during shipment. When calibration is completed and your air sampler returned, you should be able to get a calibration protocol and a sample certificate.

Maintenance: If the air sampler malfunctions, you will need maintenance support, which can usually be agreed in a separate contract from calibration. The provider should have technical support to help with any technical questions. Here, too, you will want to know whether maintenance staff is based in your region and can visit your facility or if your only option is to send in your instrument.

Microbial air samplers for specific purposes or environments

Finally, it is worth noting that some suppliers offer product variants of their microbial air samplers (or conversion options) for specific purposes or environments, for example

- Samplers with multiple sampling heads for simultaneous air sampling
- Samplers for use in isolators that allow moving parts to be placed outside the critical area
- Samplers with ATEX certification for use in explosion hazard areas
- Samplers for microbial monitoring of compressed gases

Although often quite different in appearance, such sampler variants are usually based on the technology of the supplier's standard model. Many of the discussed criteria apply to these instruments as well.

Find your air sampler

Compare the features to find the right air sampler for your needs:

	MAS-100 Sirius® air sampler	MAS-100 VF® air sampler	MAS-100 Eco® air sampler	MAS-100 Iso® line air samplers
Portable/battery operated	X	X	X	
Independent validation of efficiency	X	X		X
Several flow rate options	X			**X (coming soon)**
Mass flow sensor	X			X
Remote sampling start	X			X
HEPA filter	X			
Active VHP decontamination	X			X
Touch display	X			
Self-checks	X			
Plate size compatibility	X	X	X	X
Result barcode	X			
Wi-Fi data transfer	X			
Calibration service	X	X	X	X
Multiple sampling heads				X

Ordering information

Portable samplers

Product	Description	Order no.
MAS-100 Sirius® air sampler	Microbial air sampler	**1.17880.0001**
MAS-100 Sirius® Flex air sampler	Microbial air sampler - without lid	**1.17881.0001**
MAS-100 VF® air sampler	Microbial air sampler	**1.17103.0001**
MAS-100 Eco® air sampler	Microbial air sampler	**1.09227.0001**
MAS-100 Atmos® gas sampler	Standard microbial compressed gas sampler	**1.17328.0001**

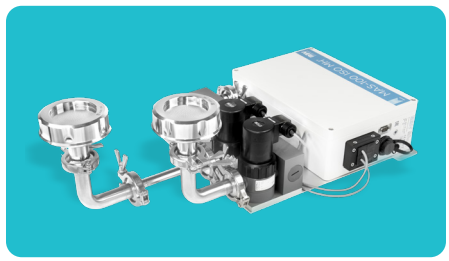
Portable microbial air samplers (left to right: MAS-100 Sirius® air sampler, MAS-100 VF® air sampler, MAS-100 Eco® air sampler)

MAS-100 Atmos® microbial compressed gas sampler

Isolator and RABS samplers

Description Control Unit	Standard Interface USB	Standard Interface USB + Ethernet	Standard Interface USB + Profibus	Standard Interface USB + Profinet
MAS-100 Iso NT® air sampler	**1.09168.0001**	**1.09174.0001**	**1.09173.0001**	**1.17291.0001**
MAS-100 Iso MH® air sampler - One head	**1.17174.0001**	**1.17178.0001**	**1.17177.0001**	**1.17292.0001**
MAS-100 Iso MH® air sampler - Two heads	**1.17118.0001**	**1.17145.0001**	**1.17144.0001**	**1.17309.0001**
MAS-100 Iso MH® air sampler - Three heads	**1.17146.0001**	**1.17148.0001**	**1.17147.0001**	**1.17310.0001**
MAS-100 Iso MH® air sampler - Four heads	**1.17149.0001**	**1.17157.0001**	**1.17155.0001**	**1.17312.0001**

MAS-100 Iso NT® microbial air sampler



MAS-100 Iso MH® microbial air sampler

Learn more on our website:
SigmaAldrich.com/air-samplers
or **contact us**

To place an order or receive technical assistance:
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For local contact information:
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MK_PG14817EN Ver. 2.0 69664 04/2026