Millipore®
Preparation, Separation,
Filtration & Monitoring Products

Application Note

Using Different Perforated Lids on the MAS-100® Family Air Samplers

Perforated Lids Make the Difference

Perforated lids are crucial to the physical and biological sampling efficiency of impaction-based microbial air samplers. Air is accelerated through the holes of the lids and forms a jet which impacts onto the agar surface **(Figure 1)**. Drawing air through leaks, irregular hole diameters, or a thin plate with holes all decrease the jet effect and therefore the sampling efficiency. MBV takes great care to produce perforated lids of highest quality. Tight production specifications assure uniformity and permit the exchange of lids between different air samplers.

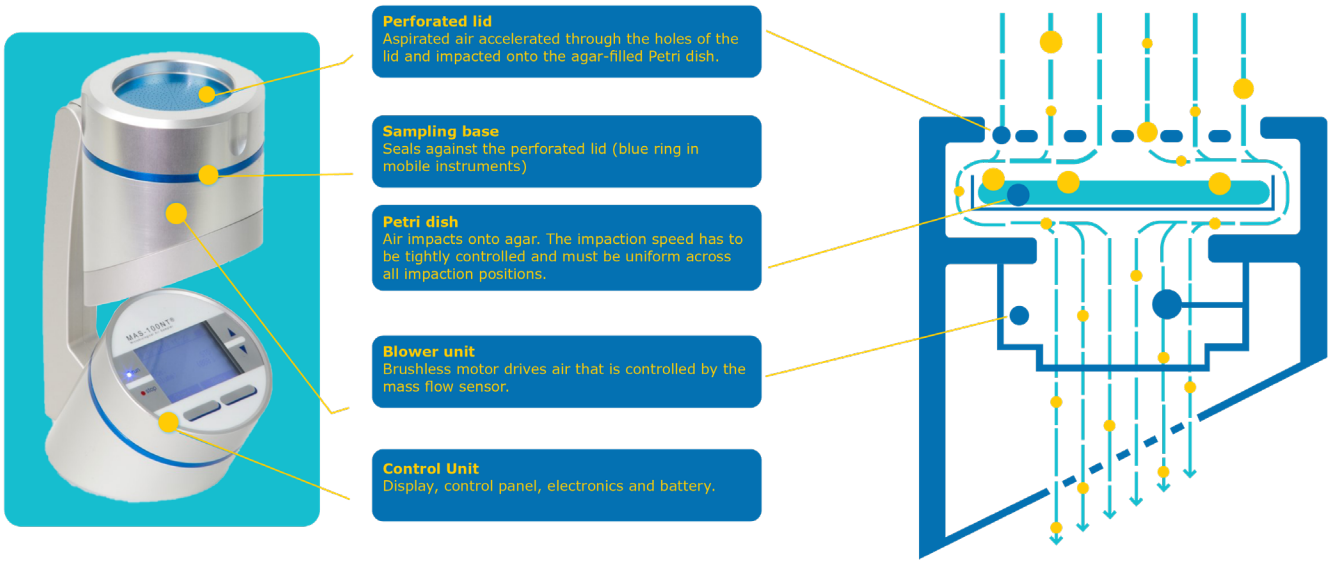

Figure 1: Functioning principle of the impaction-based microbial air sampler MAS-100 NT®. On the right schematic cross-section of the sampling head with perforated lid, agar-filled Petri dish and blower unit with airflow sensor. All Andersen-type air samplers are based on this principle. Some may not have an airflow sensor to control the blower but regulate the flow by constant blower revolutions instead.

Switching perforated lids between air samplers

Many users of impaction-based microbial air samplers own multiple perforated lids for each of their instruments. Additional lids allow the user to attach a new lid at each sampling position or new production batch. It is also beneficial to have additional lids while the used lids are being mass sterilized.

Thanks to the integrated mas flow sensor maintaining a constant air flow accuracy independently of the lid, multiple lids can be used with our air samplers without requiring to match individual lids serial numbers with specific samplers.

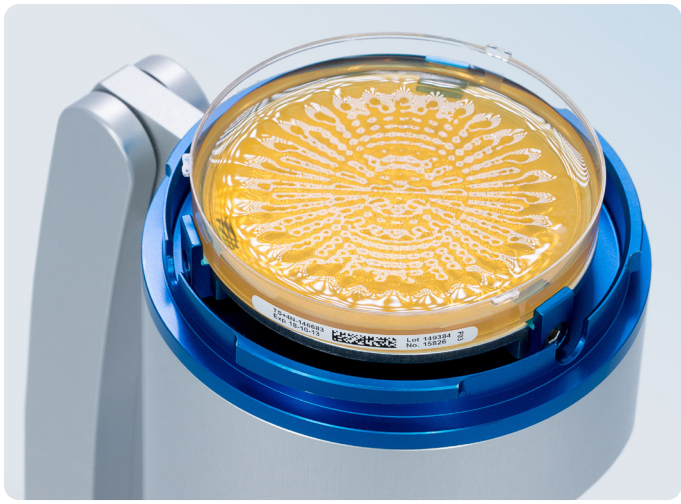

Figure 2: Standard 90 mm Petri dish on a MAS-100 NT® microbial air sampler. The impaction pattern generated by drawing 1000 l of air at 100 SLPM through a 300 x 0.6 mm perforated lid is clearly visible**.**

Tight seal between perforated lid and sampling base

Aspirating air through the seal between the lid and sampling base must be avoided **(see Figure 3)** as this air would count towards the total sampled air volume but would not impact onto the agar.

MBV takes great care to produce sampling lids and bases which are extremely flat and seal tightly.

We assure tightness between the perforated lid and the sampling base using rigorous life cycle testing.

Design: We offer also aluminum lids with edge protection. The protruding lip prevents scratching of the sealing surface during handling and autoclaving **(Figure 4)**.

Perforated lids made from stainless steel which are mainly used for isolators and RABS are equipped with an edge protection as standard. Aluminum lids with edge protection are available as an accessory.

Care should be taken to prevent any scratching of the sealing surfaces on the head and on the sampler.

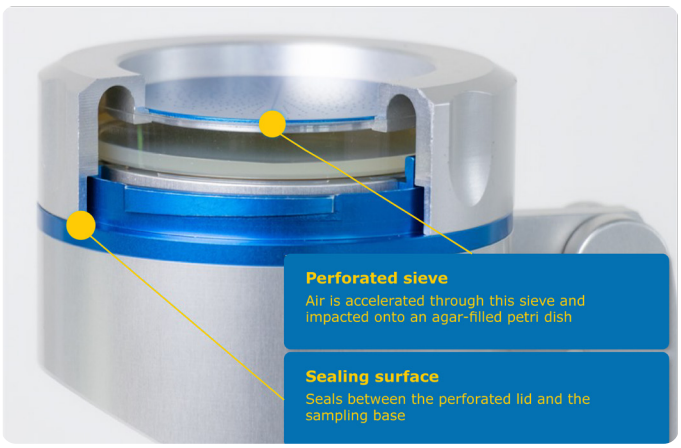

Figure 3: Cross-section of perforated lid on the sampling base. The sealing between these parts is critical for the correct operation of the air sampler

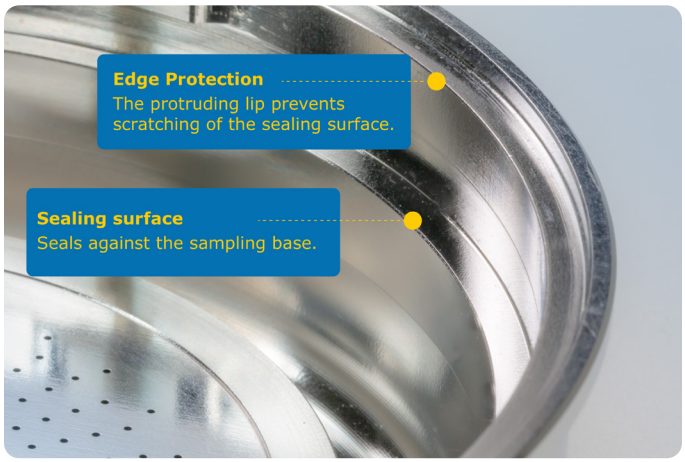

Figure 4: Stainless steel perforated lid (upside down). The edge protection prevents scratching of the sealing surface which would lead to aspirating air through the gap.

Production and quality control:

MBV AG is an ISO 9001: 2015 certified manufacturer that conducts internal audits as well as customer audits. MBV is certified by SwissTS yearly that show their processes are under control and a change control process is implemented.

All critical mechanical parts are developed and produced in-house or in long-term partnerships with Swiss companies. The products are made from the best raw material on the most modern machinery. Each lot, and some individual parts, are tested for conformity **(Figure 5 and 6)**. This meticulous focus on production quality is the basis for the longevity of the devices. It is also the reason why customers trust them in their most demanding environment.

Figure 5: Perforated lids in production. Mounting robots in combination with the most modern machining tools produce parts within very narrow specifications.
Picture courtesy Femron AG **(www.femron.ch)**

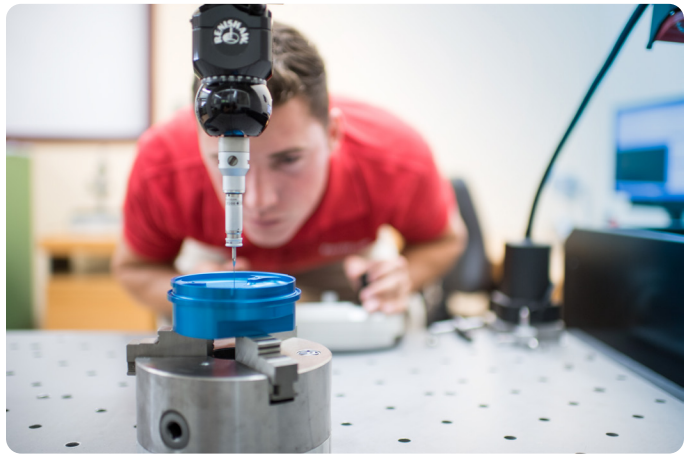

Figure 6: Quality control of a sampling base. State of the art risk-based test plans assure that production lots remain within specifications

Instrument maintenance and service:

We recommend annual recalibration of the airflow of MAS-100® microbial air samplers with our digital anemometer. A mandatory test for this regular service is the tape test where the tightness of the seal between lid and sampling base is tested.

The comparison of airflow with and without tape sealing leads to detection of minute scratches and bends (e.g. after a lid or instrument has been dropped).

Size and uniformity of perforated sieve

The sieve of the perforated lid is at the core of the air sampler. Each hole must have an identical diameter and length to accelerate the aspirated air correctly. The thickness of the perforated sieve guarantees a well-defined impaction jet. The impaction speed defines the physical sampling efficiency. The cut-off value d50 (the particle size at which 50% of the particles impact in the agar due to inertia and 50% are exhausted with the airstream) must be identical between holes and between lids. That is why intense quality control of the sieves is performed. Quality control procedures also incorporate the effect of anodization.

The cut-off value d50 at a flow rate of 100 LPM depends on the number and size of holes in the sieve plate. **Sieve plates with 300x0.6mm holes and 400x0.7mm provide a calculated d50 of 1.1µm and 1.6µm respectively.** Sieve plates with 300x0.6 mm holes are recommended as standard version for all MAS-100® air samplers except MAS-100 Eco®, which works best with 400x0.7mm sieve plates. Another reason for choosing 400x0.7mm sieve plates for MAS-100® air samplers other than MAS-100 Eco® might be the comparability with historical environmental monitoring data.

Figure 7: An aluminum sieve is tested for airflow as the anodization has an influence on the hole diameter and therefore on impaction speed.

Figure 8: Close-up of an anodized aluminum sieve. The holes are drilled through the thick plate to guarantee ideal impaction by the generated air jet effect.

The combination of these quality measures allows you to use multiple heads with our MAS-100 family of viable air samplers.

Multiple Lids on MAS-100® family instruments? YES!

This is what you need to know:

Mechanically you can mix and match any perforated lid with any base (for contact plates or standard 90mm Petri dishes).

- Because of increased wear we recommend not to use steel lids on aluminum bases.
- A re-calibration must be performed when switching between 300 x 0.6mm and 400 x 0.7mm perforated lids. New instruments are calibrated for both types and initially only choosing the correct type in th menu is required.
- If you dropped a lid or the sampler: Check first for correct sealing of lid and sampler. Then re-calibrate your air sampler.
- Avoid scratching the sealing surface of the perforated lid.

Perforated Lids - Features and Compatibility

Table 1. Specific features of perforated lids

Order Number	Product Name	Plate Format	Material	Sieve pattern [calculated d50 at 100 LPM]	Edge Protection	Remarks
1.09195.0001	Perforated lid aluminum 300x0.6 mm	90 mm	aluminum	300x0.6mm [1.1 µm]	No	
1.19363.0001	Perforated lid aluminum 300x0.6 mm with edge protection	90 mm	aluminum	300x0.6mm [1.1 µm]	Yes	
1.09189.0001	Perforated lid stainless steel 300x0.6 mm with edge protection	90 mm	Stainless steel	300x0.6mm [1.1 µm]	Yes	
1.19149.0001	Perforated lid aluminum 300x0.6 mm for contact plate	55 mm	aluminum	300x0.6mm [1.1 µm]	No	Suitable for lockable and non-lockable (e.g. ICR/ ICR+ contact plates; RT/ RT+ contact plates)
1.19154.0001	Perforated lid stainless steel 300x0.6 mm with edge protection and handle	90 mm	Stainless steel	300x0.6mm [1.1 µm]	Yes	Additional handle for safe and easy handling in isolators
1.09088.0001	Perforated lid aluminum 400x0.7 mm	90 mm	aluminum	400x0.7mm [1.6 µm]	No	
1.19364.0001	Perforated lid aluminum 400x0.7 mm with edge protection	90 mm	aluminum	400x0.7mm [1.6 µm]	Yes	
1.09222.0001	Perforated lid stainless steel 400x0.7 mm with edge protection	90 mm	Stainless steel	400x0.7mm [1.6 µm]	Yes	
1.19166.0001	Perforated lid aluminum 400x0.7 mm with clamps, fits to Growth Direct Cassettes	specific	aluminum	400x0.7mm [1.6 µm]	No	Suitable for Growth Direct® Cassettes
1.09213.0001	Perforated lid aluminum 400x0.7 mm for contact plate	55 mm	aluminum	400x0.7mm [1.6 µm]	No	Suitable for non-lockable contact plates (e.g. ICR contact plates; RT contact plates)

Table 2. Compatibility of perforated lids with MAS-100® Air Sampler family

Order Number	Product Name	MAS-100 NT® / NT Ex® (with or without filter)	MAS-100 VF®	MAS-100 Eco®	MAS-100 Iso NT® & MAS-100 Iso MH®
1.09195.0001	**Perforated lid aluminum 300x0.6 mm**	**Yes (Standard)**	**Yes (Standard)**	Not recommended	Not recommended
1.19363.0001	Perforated lid aluminum 300x0.6 mm with edge protection	Yes	Yes	Not recommended	Not recommended
1.09189.0001	**Perforated lid stainless steel 300x0.6mm with edge protection**	Not recommended	Not recommended	Not recommended	**Yes (Standard)**
1.19149.0001**	Perforated lid aluminum 300x0.6 mm for contact plate	Yes	Yes	Not recommended	Not recommended
1.19154.0001	Perforated lid stainless steel 300x0.6 mm with edge protection and handle	Not recommended	Not recommended	Not recommended	Yes
1.09088.0001	**Perforated lid aluminum 400x0.7 mm**	Not recommended	Not recommended	**Yes (Standard)**	Not recommended
1.19364.0001	Perforated lid aluminum 400x0.7 mm with edge protection	Not recommended	Not recommended	Yes	Not recommended
1.09222.0001	Perforated lid stainless steel 400x0.7 mm with edge protection	Not recommended	Not recommended	Not recommended	Yes, but not recommended
1.09213.0001**	Perforated lid aluminum 400x0.7 mm for contact plate	Not recommended	Not recommended	Yes	Not recommended

*standard perforated lids in bold
**For contact plates use, an adapter is required for MAS-100 NT / NT Ex and MAS100 Eco

Acknowledgement

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