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# USING MAS-100 INSTRUMENTS WITH GROWTH DIRECT CASSETTES

APPLICATION NOTE



### ABSTRACT

Systems that automate the incubation and reading of test samples are becoming increasingly popular in environmental monitoring. Based on the continuous monitoring of the growth of organisms, they enable rapid detection and quantification of microbes in the air. Versatile microbial air samplers that can accommodate the special agar plates for these systems facilitate their application.

MAS-100<sup>®</sup> Microbial Air Samplers are engineered to be used with a variety of different impaction media. MBV offers also a solution to adapt MAS-100 instruments for use with Growth Direct<sup>®</sup> cassettes from Rapid Micro Biosystems<sup>®</sup>. It includes a modified perforated lid, with adjusted height and hole pattern, as well as tailored fitting clamps. Consequently, Growth Direct cassettes are compatible with both MAS-100 portable and MAS-100 Iso instruments.

This application note describes in detail how the sampling heads for the MAS-100 instruments are adapted for use with Growth Direct cassettes from Rapid Micro Biosystems to maintain both the physical and biological sampling efficiency.

### INTRODUCTION: THE GROWTH DIRECT SYSTEM

In most cases, MAS-100 Microbial Air Samplers are used with standard 90 mm Petri dishes. However, adapters and specific perforated lids with matching hole patterns are available for use with 55 mm contact plates and other media such as the proprietary cassettes for the Growth Direct<sup>®</sup> system from Rapid Micro Biosystems<sup>®</sup>.

In a recent whitepaper, Rapid Micro Biosystems evaluated the MAS-100 NT<sup>®</sup> for performance compatibility with its Growth Direct Environmental Monitoring (EM) cassettes. It concludes that the MAS-100 NT is not only compatible for use with Growth Direct EM plates, but that the recovery “was seen to be equivalent to the compendial method for all tests” (Rapid Micro Biosystems 2023).

The Rapid Micro Biosystems Growth Direct system consists of three elements:

- agar plates
- an automated incubator
- advanced robotics imaging analysis

The Growth Direct agar plates have a smaller sampling area compared to standard 90 mm nutrient plates. MBV has adapted its perforated lid in terms of height and hole pattern, so that Growth Direct plates can be used with MAS-100 instruments while maintaining the same sampling efficiency.

These adjustments are described in detail in the next two chapters. All other characteristics of the perforated lid remain the same.

## PERFORATED LID HEIGHT ADAPTATION

The diameter of the sampling area of the Rapid Micro Biosystems Growth Direct cassettes is the same as that of a 55 mm contact plate (Figure 1).



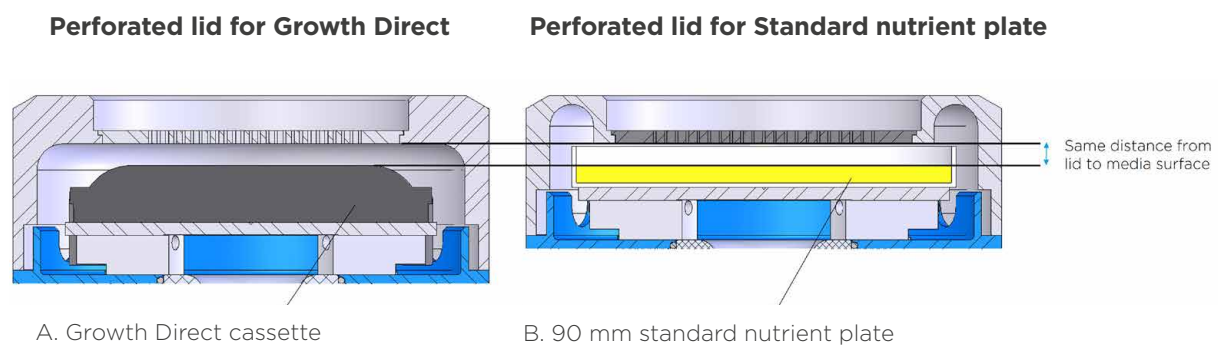
**FIGURE 1:** The sampling area of 55 mm contact plate (right) and of a Growth Direct cassette (left) have the same diameter.

To accommodate them, MBV has adapted its perforated lid originally designed for 90 mm plates.



**FIGURE 2:** Side view of standard perforated lid with for 90 mm nutrient plates (right) and perforated lid for Growth Direct consumables (left) for the MAS-100 NT air sampler.

The adapted height of the perforated lid ensures an identical distance from the bottom of the perforated sieve to the top of the impaction media (Figure 3).



**FIGURE 3:** Cross-sections of the sampling head with perforated lid for Growth Direct consumables A. and the standard lid for 90 mm nutrient plates B. for the MAS-100 NT air sampler.

All other characteristics of the perforated lid are the same as the lid for 90 mm nutrient plates:

- **Identical outer diameter** of 11 cm
- Grip recesses at the same position
- Identical **bayonet coupling** to fit the MAS-100 instruments
- **Identical inner diameter** of the perforated sieve (7 cm) to continue using the standard dust covers and maintain isokinetic sampling at 100 L/min.

### HOLE PATTERN ADAPTATION

The physical sampling efficiency (expressed as the d50 value) of an air sampler is critically dependent on the air impaction velocity (Whyte, Green, & Albisu, 2007).

MAS-100 instruments are delivered with a standard 300x0.6 mm perforated lid, showing 300 holes, each with a diameter of 0.6 mm. Its calculated (Ljungqvist & Reinmüller, 2008) and experimentally verified physical sampling efficiency at an air flow of 100 L/min is 1.1  $\mu\text{m}$  (d50). The average impaction velocity of 19.6 m/s is in the ideal range of impaction efficiency and biological viability for a number of microorganisms (Stewart, et al., 1995).

The perforated lid for use with Growth Direct cassettes also has the same number of impaction holes, with the same diameter (300x0.6 mm), and the thickness of the perforated sieve is identical to the standard lid. This ensures a directed air jet onto the impaction media and allows the same d50 at 100 L/min to be achieved. It also allows the use of the same positive impaction hole correction table (Feller, 1950).

However, the pattern of the holes was adapted and is denser on the lids to be used with Growth Direct consumables, to match their smaller sampling area (see Figure 4).



**FIGURE 4:** A. Growth Direct perforated lid for MAS-100 NT instruments compared to B. Standard perforated lid for 90 mm nutrient plates.

Aluminium perforated lids are laser marked ALI on the top rim.

## GROWTH DIRECT COMPATIBLE MAS-100 INSTRUMENTS

The following MAS-100 portable and integrated air samplers are compatible with the Growth Direct system:



**FIGURE 5:** MAS-100 instruments compatible with the Growth Direct System. A. MAS-100 portable air samplers. B. MAS-100 integrated air samplers.

To accommodate the higher Rapid Micro Biosystems Growth Direct cassettes, adapted perforated lids are available for both handheld and integrated MAS-100 instruments.

While for MAS-100 NT/Ex and MAS-100 VF, additional clamps are needed to fix the nutrient plate, for MAS-100 Iso NT/MH either a standard base or a special Growth Direct EasyClean base can be used.

The schematic overview in Figure 6 summarizes the components required for MAS-100 instrument types to be Growth Direct compatible.

	Required components		Comments	
Instrument Types	MAS-100 NT/Ex	Growth Direct clamps	Growth Direct perforated lid (aluminium)	- Adjust clamp position
	MAS-100 VF	Growth Direct clamps	Growth Direct perforated lid (aluminium)	- Adjust clamp position
	MAS-100 Iso NT/MH	Growth Direct EasyClean base	Growth Direct perforated lid (stainless steel)	- Standard base is compatible with Growth Direct cassettes

**FIGURE 6:** Schematic overview of Growth Direct compatible portable (yellow) and integrated (blue) microbial air samplers and the components required for each instrument type to be Growth Direct compatible.

**USING GROWTH DIRECT CASSETTES WITH MAS-100 PORTABLE INSTRUMENTS**

Specially designed clamps center and hold the Growth Direct cassette in place when used with the MAS-100 NT and MAS-100 VF portable instruments (Figure 7).

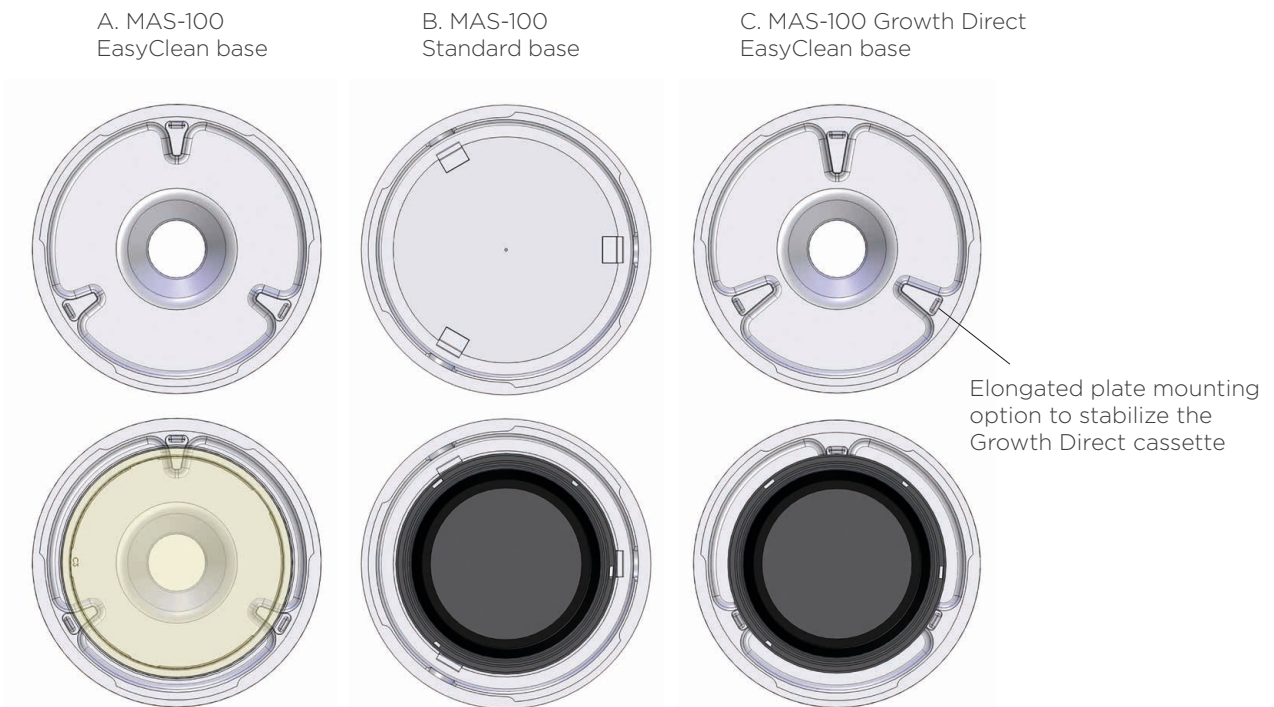


**FIGURE 7:** Demonstration of mounting Growth Direct clamps on MAS-100 NT (left) and MAS-100 VF instruments (right).

**USING GROWTH DIRECT CASSETTES WITH MAS-100 ISO INSTRUMENTS**

The sampling head of MAS-100 Iso instruments consists of a perforated lid and a base on which the agar plate is positioned. Two types of bases are available:

- The standard base is compatible with the Growth Direct plate.
- An adapted EasyClean base is available that centers the positioning of the Growth Direct plate. It must be ordered separately (Figure 8).



**FIGURE 8:** Top view of MAS-100 Iso bases: A. MAS-100 EasyClean base with standard 90 mm nutrient plate. B. MAS-100 standard base with Growth Direct cassette. C. MAS-100 Growth Direct EasyClean base with Growth Direct cassette. An extended plate mounting option has been developed to stabilize the Growth Direct plate.

## CONCLUSION

To use MAS-100 instruments with Growth Direct cassettes from Rapid Micro Biosystems and benefit from systems that automate the incubation and reading of test samples, MBV provides all necessary accessories.

To accommodate the higher Growth Direct nutrient plates, modifications were made to the perforated lids in terms of height and regarding the hole pattern. This ensures that the sampling efficiency is the same. Specialized clamps for the handheld and EasyClean bases for integrated instruments complement the accessories.

This addition to MBV's offering facilitates the use of advanced microbial air sampling techniques, aligning with the requirements for environmental monitoring and industry standards.

## ABOUT THE AUTHOR



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Miriam Schönenberger is a microbiologist and holds a PhD in cancer research from ETH Zurich.

She has many years of experience in business development and after sales of laboratory equipment and channeled customer needs into concrete product portfolio strategies.

At MBV AG, she is responsible for the products for microbial air monitoring in isolators and RABS and develops convincing solutions for aseptic production together with interdisciplinary teams.



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### REFERENCES

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### FURTHER INFORMATION

MBV has not performed efficiency tests with the customized perforated lid for Growth Direct consumables. Rapid Micro Biosystems evaluated the MAS-100 performance compatibility with Growth Direct cassettes (Rapid Micro Biosystems 2023).

Additional information on related topics can be found here:

Information on perforated lids: [www.mbv.ch/en/products/accessories/perforated\\_lid/](http://www.mbv.ch/en/products/accessories/perforated_lid/)

Use of different perforated lids on MAS-100 instruments:

[www.mbv.ch/media/an\\_46\\_using\\_different\\_perforated\\_lids\\_on\\_mas-100\\_viable\\_air\\_samplers.pdf](http://www.mbv.ch/media/an_46_using_different_perforated_lids_on_mas-100_viable_air_samplers.pdf)

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Additional information can be found on our [FAQ page](#).

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## ORDERING INFORMATION

Outside Switzerland, MBV products are also distributed and supported by our partner Merck. For inquiries quote the following article numbers:

MBV Art.	MBV Art. old	Merck Art.	Description	Comments	Marking Code
<b>For MAS-100 NT/Ex and MAS-100 VF instruments</b>					
130.3564	06.6048.01	1.17315.0001	Perforated lid BAJ CP Alu 300x0.6 (ALI)	Growth Direct perforated lid aluminum 300x0.6mm	ALI
130.3565	06.6050.01	1.17316.0001	Perforated lid BAJ CP Alu 300x0.6 clamping jaws (ALI)	Perforated lid with 3 clamps	ALI
130.0322.02	06.6012.01	1173180001	Perforated lid BAJ CP Alu 400x0.7 (BLI)	Perforated lid only	BLI
130.0325	06.6018.01	1.19166.0001	Perforated lid BAJ CP Alu 400x0.7 clamping jaws (BLI)	Perforated lid with 3 clamps	BLI
101.027.01	06.6203.01	N/A	MAS-100 NT Growth Direct 300x0.6mm	Includes instrument, perforated lid	ALI
101.028.01	06.6204.01	N/A	MAS-100 NT Growth Direct 400x0.7mm	Includes instrument, perforated lid	BLI
<b>For MAS-100 Iso instruments</b>					
108.070	04.4113.01	N/A	Base BAJ standard steel	Standard base	N/A
130.4033	04.4948.01	1173190001	Base BAJ GD EasyClean steel	Base without perforated lid	N/A
130.4039	04.4948.01	1173140001	Perforated lid BAJ GD EP steel 300x0.6mm	Standard perforated lid for Growth Direct cassettes in isolators	ANL

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