ANALYT MESSTECHNIK



OPERATING MANUAL

SKC BioStage Impactor

Cleaning, loading agar plates, verifying the 28.3 L/min flow and sampling viable bacteria and mould with the BioStage single-stage impactor, with maintenance, technical data and ordering information.

AMTC-MN-0019

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About this manual

The SKC BioStage® is a single-stage viable cascade impactor. A high-flow pump draws air through it at 28.3 L/min, and bacteria and mould spores in the air land on an agar plate inside, where a laboratory later grows them into countable colonies. This manual covers the whole cycle: cleaning and sterilising the impactor, loading an agar plate, verifying the flow rate, sampling, and packing the plates for the laboratory. It closes with maintenance, the technical data and the order numbers of accessories and spare parts.

Read Hygiene and handling (p. 8) before your first sample: a viable sample is only as good as the care taken to keep the impactor and the agar free of stray organisms. To take a sample, follow Loading an agar plate (p. 9), Verifying the flow rate (p. 9) and Sampling (p. 10) in that order.

The manual applies to the BioStage impactor and to the BioStage Pump Kit. Analyt-MTC supplies and supports the BioStage; for questions, spare parts and accessories see Service, warranty and contacts (p. 16).

Keep this manual for the lifetime of the product. The current revision is on the product page at analyt-mtc.com.

How this manual marks information

NOTICE

Practices not related to personal injury — damage to the product, the process or the sample.

Note
Information that helps understanding; never a hazard.

Document information

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Rev.	Date	Change
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CHAPTER 1

Safety

Read the safety messages in this chapter before you use the BioStage. Each one also appears in the procedure where it applies. The safety messages protect the impactor and the agar plates; the notes name what makes a sample give a wrong result.

Intended use

The BioStage is a single-stage viable impactor. It collects mould and bacteria from indoor and outdoor air onto an agar plate, which a laboratory then cultures and counts. Run it at 28.3 L/min with a high-flow pump such as the SKC QuickTake 30, mounted on the pump with the mounting bracket or on a tripod stand (see Product description (p. 6)). The QuickTake 30 pump is not CE marked.

Do not use the BioStage in any of these ways, because the sample is then not valid:

- running the pump with no agar plate in the impactor;
- sampling on agar that is past its expiry date, cracked or contaminated, or on a plate still cold from the refrigerator;
- sampling for less than 2 or more than 5 minutes.

Hygiene

Sanitise your hands or wear disposable gloves whenever you handle the impactor or the agar plates, and sanitise them again whenever handling may have contaminated them.

Agar plates

NOTICE

The fill height of the agar sets its gap to the jet classification stage. If the agar surface is not 1.0 to 1.5 mm below the underside of the stage, the impactor no longer separates particles at its rated cut-point. Plate dimensions vary between makers and change the fill height. Confirm with your agar supplier that the plates you order hold the required volume.

NOTICE

A plate still cold from the refrigerator, or a run without a plate in place, makes the sample invalid. Use only plates that have warmed to ambient temperature (about 20 minutes out of the refrigerator), and never run the pump without a plate in place.

Handling and cleaning the impactor

NOTICE

Contamination, unsuitable agar and autoclave heat put the sample and the impactor at risk. Contamination or unsuitable agar spoils the sample, and autoclaving damages the O-rings. Sanitise your hands or wear disposable gloves. Sanitise hands and impactor again whenever handling may have contaminated them. Do not touch the holes in the jet classification stage. Never use agar that is past its expiry date, shows visible cracks or is contaminated. Let refrigerated agar plates warm to ambient temperature, which takes about 20 minutes, before you use them. Never run the pump with the BioStage connected unless an agar plate is in place. If you autoclave the aluminium parts, remove the O-rings first.

NOTICE

Handling and autoclave heat put the impactor at risk. Fingers on the holes of the jet classification stage can contaminate it, and autoclaving damages the O-rings. Do not touch the holes in the jet classification stage. Remove the O-rings before you autoclave the aluminium parts.

Sampling and shipping

NOTICE

Contamination, unsuitable agar and draughts can spoil the sample or give a wrong result. Sanitise your hands or wear disposable gloves, and clean and sterilise the BioStage between samples. Never use agar that is past its expiry date, cracked or contaminated. Let the agar plates warm to ambient temperature, about 20 minutes. Indoors, close all doors and windows that could affect the airflow in the sampling area.

NOTICE

A sample time outside 2 to 5 minutes gives a wrong result. A longer sample can overload the plate, and a shorter one can miss organisms that are present (false negatives). Keep the sample time to 2 to 5 minutes.

NOTICE

Ice packs are cold enough to freeze agar. If they touch the plates, the agar may freeze. Pack the plates so that the ice packs do not touch them.

CHAPTER 2

Product description

The BioStage meets NIOSH requirements and ACGIH recommendations for sampling mould and bacteria in indoor and outdoor air. It has no electronics of its own: a high-flow pump such as the SKC QuickTake 30 provides the airflow, and the impactor separates the organisms from the air onto agar.

How it works

The pump draws air into the inlet cone and through the jet classification stage, a plate with 400 precision-drilled holes (jets). The air leaves each jet fast enough that microorganisms cannot follow it round the bend: they strike the agar surface just below and stay on it. The air leaves through the outlet on the base plate to the pump.

The agar plate sits on three raised metal pins in the base plate. The jet classification stage screws onto the base plate and the inlet cone presses onto the stage; O-rings in the inlet cone and in the base plate seal the joints. The SureLock positive seal replaces spring clamps and keeps the sample intact.

The BioStage runs at 28.3 L/min. It can sit directly on the QuickTake 30 pump with a mounting bracket, or on a tripod stand, connected to the pump by tubing.



Figure 1. The BioStage, assembled.
1 Inlet cone · **2** Jet classification stage (400 holes) · **3** Base plate, holds the agar plate · **4** Outlet, to the pump

Checking the contents

Check the delivery against the table; the order codes are in Ordering information (p. 15). If anything is missing, contact Analyt-MTC; see Service, warranty and contacts (p. 16).

Item	Contents
BioStage impactor	BioStage single-stage viable cascade impactor
BioStage Pump Kit	BioStage impactor, QuickTake 30 pump with Li-Ion battery, AC charger/adapter (100–240 V), mounting bracket with inlet adapter, calibration adapter, tubing, rotameter, deluxe carry case

Note
The QuickTake 30 pump is not CE marked.

What you need

Item	Requirement
Agar plates	15 × 90–100 mm, filled with a suitable agar. Recommended volume: 27 mL of medium in a glass Petri plate, or 45 mL in a disposable plastic plate. Store the plates as the supplier specifies.
Pump	A high-flow pump that holds 28.3 L/min, e.g. the QuickTake 30 Sample Pump (see Accessories and spare parts (p. 15))
Tubing	1/4 in. ID and 3/8 in. ID
Flow verification	Reducing adapters, 1/4 to 3/8 in. tubing; calibration adapter P33100; a flowmeter such as the rotameter in the pump kit

Note
Agar plates are not included: the microbiological media come from analytical laboratories.

NOTICE

The fill height of the agar sets its gap to the jet classification stage. If the agar surface is not 1.0 to 1.5 mm below the underside of the stage, the impactor no longer separates particles at its rated cut-point. Plate dimensions vary between makers and change the fill height. Confirm with your agar supplier that the plates you order hold the required volume.

Suggested media

Bacteria	Tryptic Soy Agar (TSA) or Blood Agar Plates (BAP)
Mould	Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), Dichloran Glycerol 18 Agar (DG-18) or Corn Meal Agar (CMA)

Ask the laboratory that will analyse the samples which agar suits your question; it can usually supply the plates as well.

CHAPTER 3

Operation

Operation runs from a clean impactor to the plates on their way to the laboratory: clean and sterilise the BioStage and load an agar plate; verify the flow rate with a representative plate; take the sample; then remove the plate and ship it.

Every organism that reaches the agar grows into a colony, whether it came from the air you sampled, from your hands or from the last sample. Clean the BioStage before its first use and between uses, sterilise it between samples, and load each plate with clean hands.

Hygiene and handling

NOTICE

Contamination, unsuitable agar and autoclave heat put the sample and the impactor at risk. Contamination or unsuitable agar spoils the sample, and autoclaving damages the O-rings. Sanitise your hands or wear disposable gloves. Sanitise hands and impactor again whenever handling may have contaminated them. Do not touch the holes in the jet classification stage. Never use agar that is past its expiry date, shows visible cracks or is contaminated. Let refrigerated agar plates warm to ambient temperature, which takes about 20 minutes, before you use them. Never run the pump with the BioStage connected unless an agar plate is in place. If you autoclave the aluminium parts, remove the O-rings first.

Cleaning

1. Take the BioStage apart: lift off the inlet cone, then unscrew the jet classification stage and lift it off the base plate.
2. Put the parts in an ultrasonic bath filled with water and a mild detergent.
3. Rinse the parts thoroughly and let them air-dry in a dust-free place. While the parts are apart, check both O-rings; see Checking the O-rings (p. 13).

Sterilising

1. Remove the O-rings from the inlet cone and the base plate and put them aside.
2. Immerse the other parts in 70 % isopropanol or 70 % ethanol, then let them air-dry.
3. Refit the O-rings.

Note
In the field. Without an immersion bath, wipe the parts and the O-rings with a sterile gauze pad moistened with 70 % isopropanol or ethanol, and let them air-dry.

Loading an agar plate

Use a representative plate for the flow check and a new, unexposed plate for each sample.

NOTICE

A plate still cold from the refrigerator, or a run without a plate in place, makes the sample invalid. Use only plates that have warmed to ambient temperature (about 20 minutes out of the refrigerator), and never run the pump without a plate in place.

1. Lift the inlet cone up and off the impactor.
2. Unscrew the jet classification stage gently and lift it off the base plate. Check the O-rings; see Checking the O-rings (p. 13).
3. Take the lid off the agar plate and put the lid in a clean resealable bag; you will need it to close the plate after sampling.
4. Set the open plate on the three raised metal pins in the base plate.
5. Screw the jet classification stage gently back onto the base plate.
6. Align the inlet cone with the stage and press it on until it seals securely.



Figure 2. Loading an agar plate. **1** Inlet cone lifted off (step 1) · **2** Jet classification stage lifted off (step 2) · **3** Plate on the pins of the base plate (step 4) · **4** Impactor reassembled (steps 5 and 6)

Verifying the flow rate

The BioStage is operated at 28.3 L/min. Check the flow through the whole sampling train, with a representative agar plate in the impactor, before you sample. The steps below use the QuickTake 30 pump and the parts of the BioStage Pump Kit.

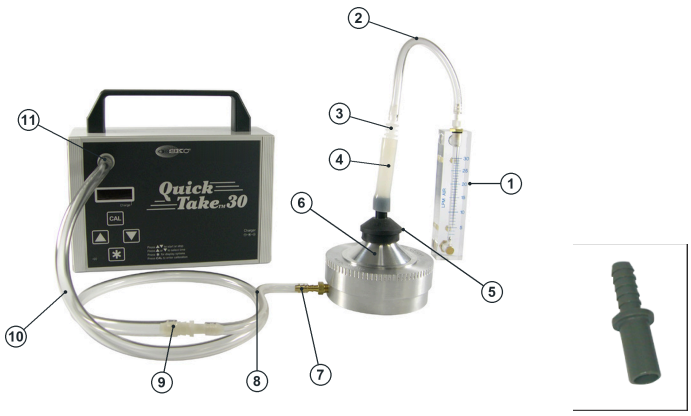


Figure 3. Flow verification train with the QuickTake 30 pump.
1 Rotameter (outlet at the top) · **2** 1/4 in. ID tubing · **3** Reducing adapter · **4** 3/8 in. ID adapter tubing (short) · **5** Calibration adapter · **6** BioStage inlet · **7** BioStage outlet · **8** 1/4 in. ID tubing · **9** Reducing adapter · **10** 3/8 in. ID sampling tubing · **11** Pump inlet with pump inlet adapter · Inset: pump inlet adapter

Connecting the verification train and checking the flow

1. Assemble the BioStage with a representative agar plate in place; see Loading an agar plate (p. 9).
2. Push the small end of a reducing adapter (3) into the free end of the 1/4 in. tubing (2) on the rotameter outlet.
3. Push the large end of the reducing adapter into the short piece of 3/8 in. adapter tubing (4).
4. Fit the free end of the adapter tubing onto the calibration adapter (5).
5. Press the calibration adapter onto the BioStage inlet (6) until it seals firmly.
6. Connect one end of a 1/4 in. ID tubing (8) to the BioStage outlet (7).
7. Push the small end of a second reducing adapter (9) into the free end of that tubing.
8. Push the large end of the second reducing adapter into one end of the 3/8 in. sampling tubing (10), and the pump inlet adapter into its other end.
9. Push the pump inlet adapter into the pump inlet (11).
10. Run the pump and verify that the flow through the verification train is 28.3 L/min, following the flow verification procedure in the pump's operating instructions (for the QuickTake 30: SKC form 40079).
11. When the flow is verified, remove the calibration adapter, its tubing and the flowmeter from the BioStage inlet.

Note
The representative plate serves only for the flow check. Each sample is taken on a new, unexposed plate; see Sampling (p. 10).

Sampling

A sample takes 2 to 5 minutes. Plan the samples before you start: besides the samples in the area of concern, take an indoor control sample in an area without complaints and outdoor samples for comparison, and keep one blank plate for each sample.

Before you sample

NOTICE

Contamination, unsuitable agar and draughts can spoil the sample or give a wrong result. Sanitise your hands or wear disposable gloves, and clean and sterilise the BioStage between samples. Never use agar that is past its expiry date, cracked or contaminated. Let the agar plates warm to ambient temperature, about 20 minutes. Indoors, close all doors and windows that could affect the airflow in the sampling area.

Taking a sample

1. Connect the BioStage outlet to the pump inlet, either with flexible tubing or by mounting the BioStage on the QuickTake 30 with the Mounting Bracket, Cat. No. 228-9531 (Figure 4). The bracket comes with its own instructions (SKC form 40066).
2. Load a new, unexposed agar plate as described in Loading an agar plate (p. 9): remove the inlet cone and stage, place the plate, put its lid in a clean resealable bag, and reassemble the impactor.

   NOTICE

   A sample time outside 2 to 5 minutes gives a wrong result. A longer sample can overload the plate, and a shorter one can miss organisms that are present (false negatives). Keep the sample time to 2 to 5 minutes.
3. Switch on the pump and sample for 2 to 5 minutes.
4. Switch off the pump and disconnect the flexible tubing from the BioStage outlet. If the BioStage is mounted on the QuickTake 30, pull the inlet adapter out of the pump inlet and the inlet adapter tubing off the BioStage outlet.
5. Remove the plate as described in Removing and shipping the plate (p. 11).
6. For the next sample, sterilise the impactor as described in Sterilising (p. 8), load a fresh plate and repeat from step 2.



Figure 4. BioStage on the QuickTake 30 pump with the mounting bracket.

Removing and shipping the plate

1. Remove the inlet cone and the jet classification stage.
2. Take out the exposed agar plate and put its lid back on at once.
3. Label the bottom of the plate with all the sampling information the laboratory asks for. Tape the lid to the plate and put the plate in a sealable bag.

   NOTICE

   Ice packs are cold enough to freeze agar. If they touch the plates, the agar may freeze. Pack the plates so that the ice packs do not touch them.
4. Pack the plate in a cool box with ice packs, as the laboratory instructs.
5. Send the sample plates, together with a blank plate, to the laboratory immediately.

Note

Blank plate. NIOSH suggests a blank for each sample: load a representative agar plate into the BioStage and unload it again straight away. It then goes to the laboratory with the samples.

Note
Mark every plate clearly, including the control and outdoor samples, so the laboratory can compare them.

CHAPTER 4

Maintenance

The BioStage needs little more than cleaning between uses, described in Cleaning (p. 8), and an eye on its two O-rings, which make the seal that keeps unsampled air out.

Checking the O-rings

Check the O-ring in the inlet cone and the one in the base plate whenever you clean the impactor or load a plate.

Check	The O-ring is in order when
Surface	it is smooth, without cracks, cuts or other damage
Fit	it sits properly in its channel in the inlet cone or base plate
Height	it lies flush with the upper lip of the channel

Replace an O-ring that is damaged, stretched or thinned; the spare O-rings are listed under Accessories and spare parts (p. 15).

NOTICE

Handling and autoclave heat put the impactor at risk. Fingers on the holes of the jet classification stage can contaminate it, and autoclaving damages the O-rings. Do not touch the holes in the jet classification stage. Remove the O-rings before you autoclave the aluminium parts.

CHAPTER 5

Specifications

Performance and materials

Flow rate	28.3 L/min
Jet classification stage	400 holes, 0.25 mm diameter
Median cut-point (D_{50})	0.6 µm
Inlet cone and base plate	Precision-machined aluminium, autoclavable
O-rings	BUNA-N, Duro 50; not autoclavable
Tubing connections	1/4 in. ID and 3/8 in. ID

Sample media and analysis

Agar plates	15 × 90–100 mm; choose the agar with the laboratory, see Suggested media (p. 7)
Agar volume	27 mL in a glass Petri plate · 45 mL in a disposable plastic plate
Gap, agar surface to jet stage	1.0–1.5 mm
Sampling time	2–5 minutes
Analysis	Colony culture

References

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CHAPTER 6

Ordering information

Order from Analyt-MTC with the order codes.

Impactor and pump kit

Description	Order code
BioStage single-stage viable cascade impactor	225-9611
BioStage Pump Kit: BioStage impactor, QuickTake 30 pump with Li-Ion battery, AC charger/adapter (100–240 V), mounting bracket with inlet adapter, calibration adapter, tubing, rotameter, deluxe carry case (contents: Checking the contents (p. 6))	228-9530K

Accessories and spare parts

Description	Order code
PUMP AND MOUNTING	
QuickTake 30 Sample Pump with rotameter and charger, 100–240 V*	228-9530A
Mounting Bracket for the QuickTake 30: holds the BioStage on the pump during sampling; with thumbscrews and inlet adapter	228-9531
Tripod Stand for the BioStage	228-506
TUBING AND FLOW VERIFICATION	
Calibration Adapter for the BioStage: connects tubing to the BioStage inlet	P33100
Tubing, 3/8 in. ID, 10 ft	225-1351
Tubing, 1/4 in. ID, 10 ft	225-13-4
Reducing Adapter for tubing, 1/4 to 3/8 in. ID, pack of 2	P31211
Stem Tubing Adapter, pack of 2	P31239
SPARE PARTS	
Replacement O-ring for the base plate, each	P32287
Replacement O-ring for the inlet cone, pack of 2	P31893

* The QuickTake 30 pump is not CE marked.

CHAPTER 7

Service, warranty and contacts

Analyt-MTC is your contact for everything concerning the BioStage: technical questions, missing items, spare parts and accessories, and warranty claims. For the choice of agar and the analysis of your samples, work with your microbiology laboratory.

Contact

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Before you contact Analyt-MTC

Have the following at hand so that Analyt-MTC can help you quickly:

- the catalogue number of the impactor or kit (Ordering information (p. 15));
- the pump you use with it;
- what happened, and when.

Warranty

The BioStage is covered by Analyt-MTC's terms of sale and warranty. Make warranty claims to Analyt-MTC, and check with Analyt-MTC before you return a product.

Disposal

Dispose of the impactor under local regulations; separate metal, glass and plastic parts for recycling where possible.

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