

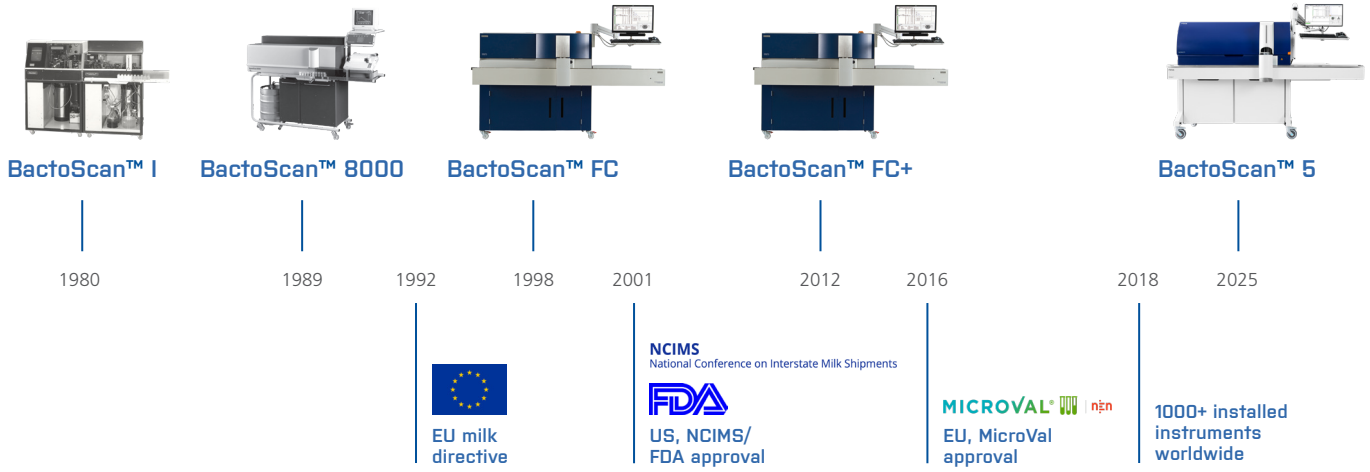
FOSS

BACTOSCAN™ 5

Boost your productivity in raw milk bacteria analysis



ANALYTICS BEYOND MEASURE

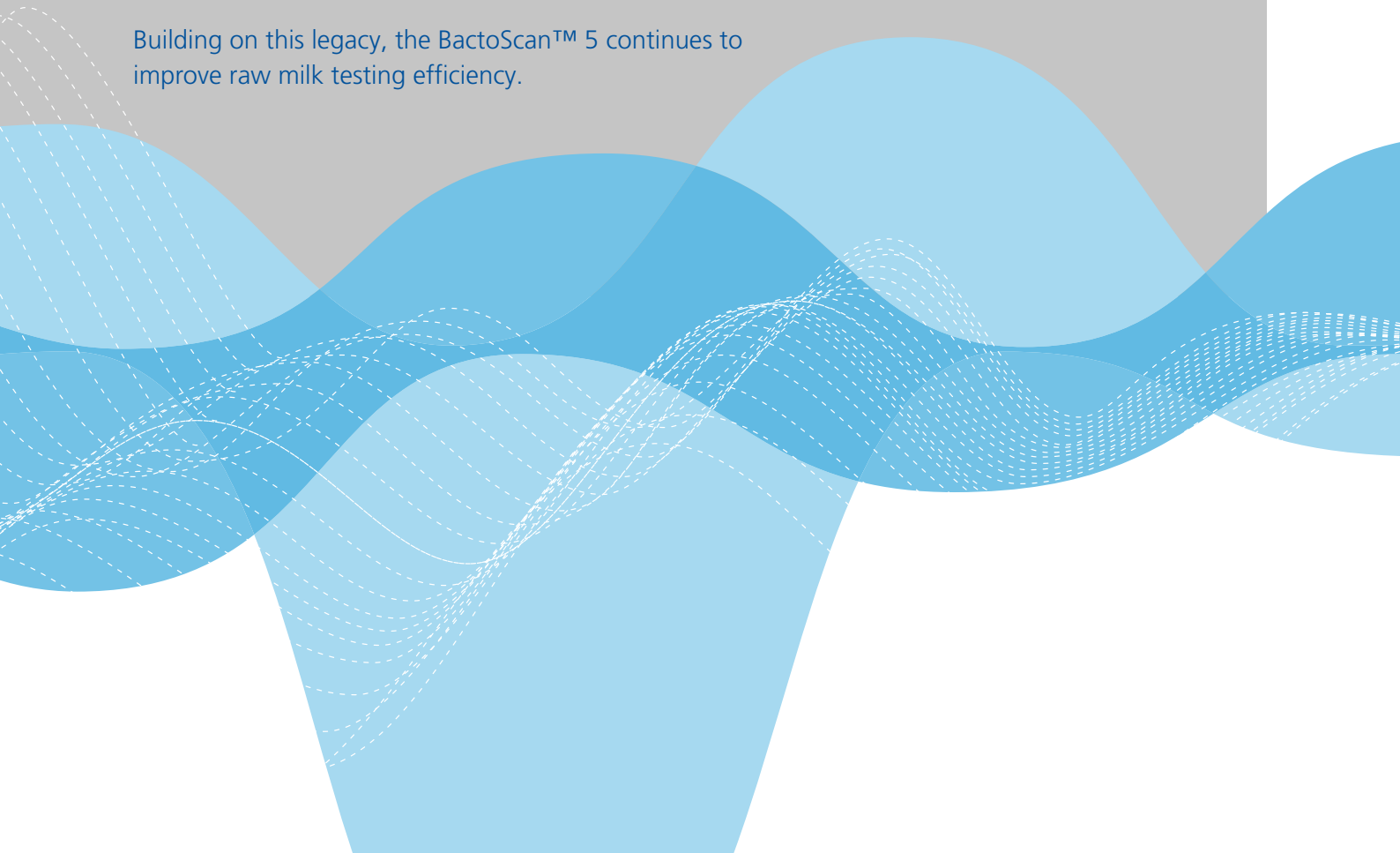


Innovation driven milk quality

FOSS has been at the forefront of revolutionizing milk quality since the introduction of the pioneering BactoScan™ technology in 1980.

Based on the measurement of Individual Bacteria Count (IBC) for accurate determination of the hygienic quality of raw milk, the first BactoScan set a new standard for rapid and accurate bacteria count, paving the way to improving milk quality and food safety in dairy. Over a span of 40 years, BactoScan has continued to evolve in parallel with the needs of the dairy industry, milk testing laboratories and developments in milk testing regulations. For decades, BactoScan has been the industry standard with all major official approvals and more than 1000 instruments installed worldwide.

Building on this legacy, the BactoScan™ 5 continues to improve raw milk testing efficiency.



A THREAT TO BACTERIA. A BOOST FOR YOUR PRODUCTIVITY

Change is happening throughout the dairy industry. Dairy farms are consolidating and milk testing requirements are changing. Testing frequency, cost pressure, demands for faster turn-around time, and trustworthiness of analytical results are all increasing, adding pressure on busy laboratories. At the same time, climate change may lead to changing microbial flora, highlighting the fact that continuous testing and monitoring is essential. Finally, environmental requirements for laboratories are subject to continuous development as well.

In this evolving landscape, the ability to increase uptime, improve workflow, and lower the cost of ownership, is the key to ensuring a competitive edge.

So, how do we rise to the challenge and boost productivity in the laboratory when it comes to testing for bacteria in raw milk?

Introducing BactoScan™ 5

Sometimes, in business, it pays to think small. Bacteria small. The innovative BactoScan™ 5 will help you get right down to the nitty-gritty of business.

BactoScan 5 allows you to analyze bacteria in raw milk more efficiently and with an unprecedented level of safety, making it easier than ever before to improve food safety and ensure milk quality.

Profit from superior instrument uptime, increased throughput, flexible capacity and less operator steps for an optimised workflow. Minimize options for human error - and time spent on reagent preparation, maintenance and cleaning. And responsibly reduce the use of chemicals and waste.

Small things, perhaps. However, these benefits translate into a significantly reduced cost of ownership, and ultimately, a better business.



BACTERIA UNDER CONTROL. MILK QUALITY ON THE RISE

Milk quality today has improved remarkably since the 1980's. In the diagram below, we clearly see that the amount of milk samples with low bacteria content has increased over the past decades. This change suggests that significant improvements, particularly in terms of farm hygiene, have contributed to the improved quality and safety of milk.

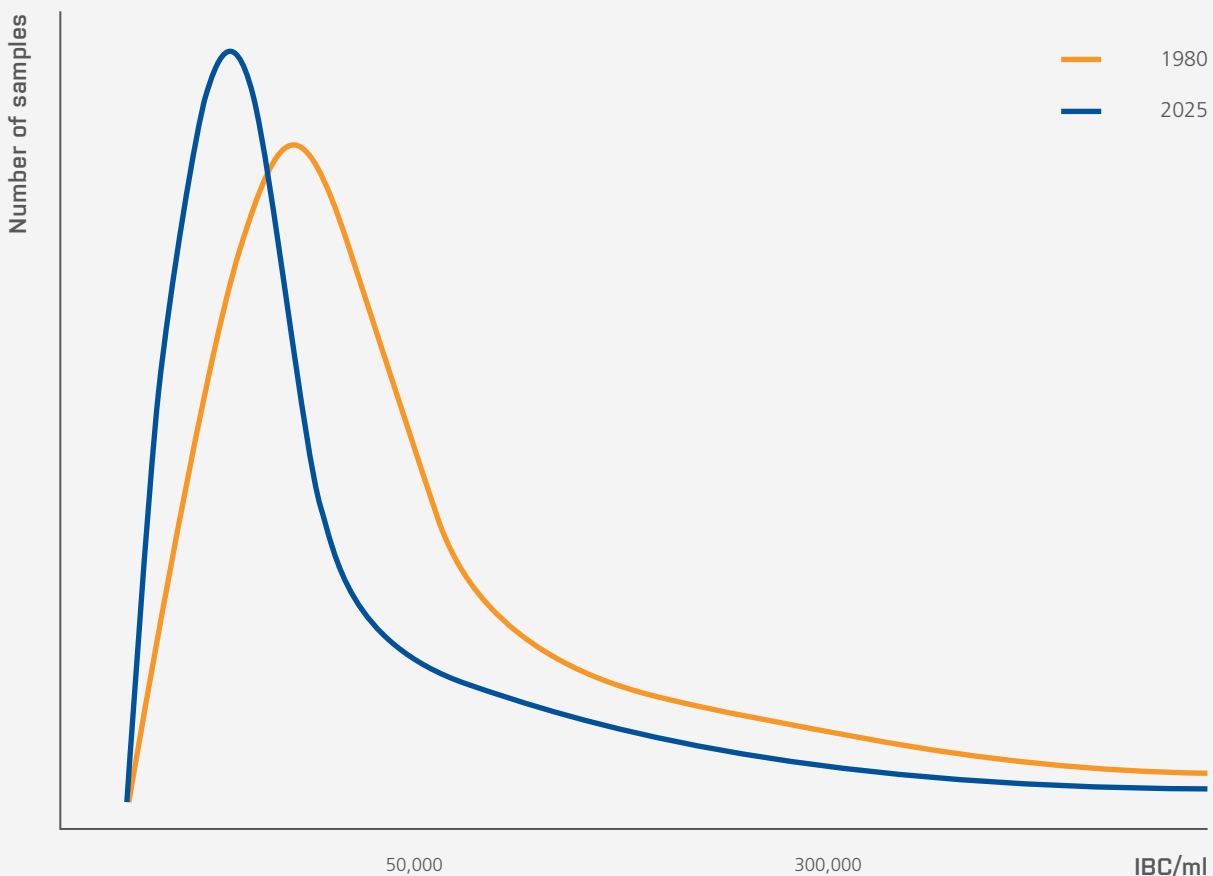
These improvements and the resulting high quality of milk we see today has been enabled by cost-efficient

technology such as BactoScan™, allowing analysis of large numbers of samples, which was the basis for including bacteria as a milk payment parameter. That way, dairies could financially incentivize milk producers to produce high quality milk.

Benefits of the IBC method

BactoScan™ 5 counts individual bacteria (IBC) and displays results in IBC/ml, delivering a fully standardized method, with a higher accuracy, reproducibility,

The amount of milk samples with low bacteria content has increased over the past decades.





and repeatability than the plate count method, that counts clusters of bacteria.

In addition to this, BactoScan 5 can run up to 200 samples per hour, and delivers results in just nine minutes. Thus, farmers can be advised about possible problems the same day as the sample is drawn allowing timely correction for leaks, insufficient cleaning or cooling in the milking system, or health problems in the herd.

In comparison, the traditional plate count method requires two to three days of incubation, leading to a risk of hygienic problems on the farm going undetected for days. This makes corrective actions more difficult and may result in production losses on farms and in dairies, being larger than necessary.

Conversion from IBC to CFU

With Colony Forming Units (CFU) as the reference method, conversion of IBC to CFU has been a common practice in raw milk testing since the introduction of rapid BactoScan technology. Subsequently, the BactoScan 5 software includes a Conversion Guide, an easy and rapid software tool to develop a robust conversion table between IBC and CFU.

- In compliance with ISO 21187: 2021 (IDF196: 2021)
- Automatic calculation of agreement ($S_{y,x}$) with CFU
- Easy trouble shooting and traceability of outliers
- Excellent storage for data generated over time
- Simple and time effective
- Enables users to meet governmental and legislative requirements
- Enables use of comparable grading limits for payment schemes

Is conversion to CFU still the way forward?

There is no doubt that conversion of IBC to CFU has paved the way for flow cytometry based solutions such as BactoScan™. However, as IBC measurement has become the de facto industry standard in raw milk testing today, with millions of measurements being performed every year, it is worth considering some of the challenges of IBC to CFU conversion.

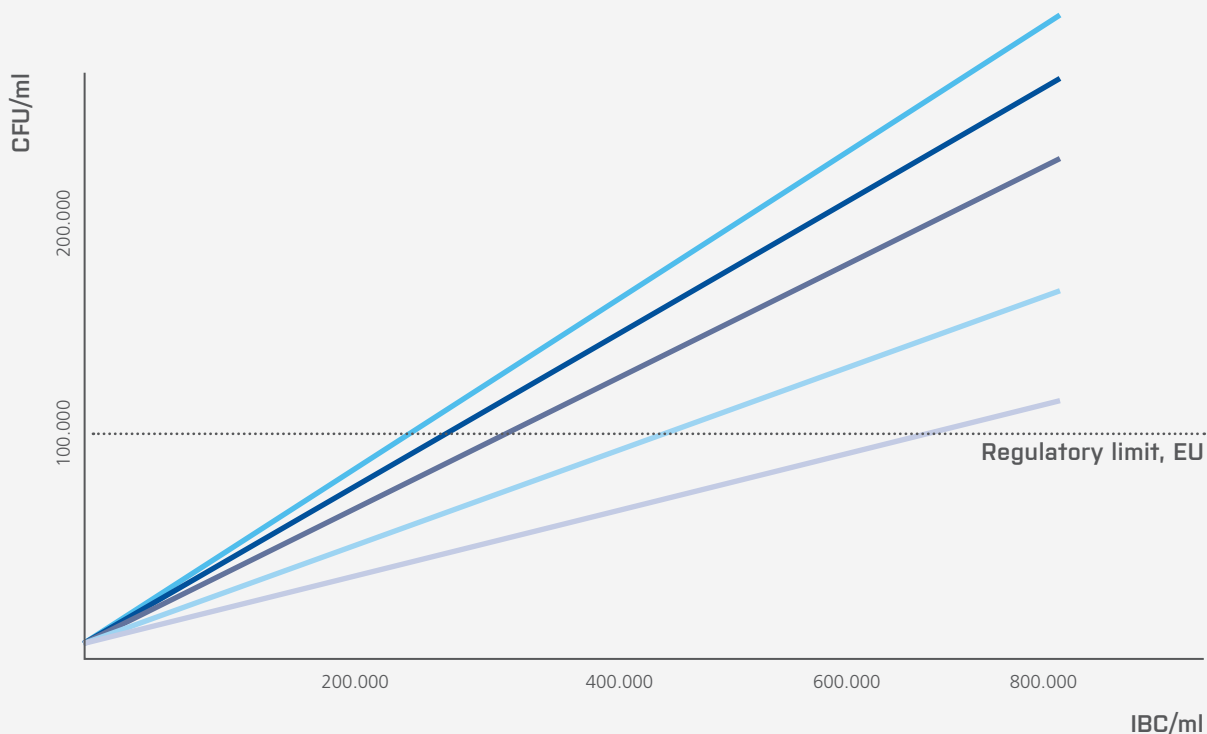
First of all, standardizing the equations used is tricky, even if the same plate count version is used, as different countries and regions apply different processes. These variations may have several causes such as the use of different agar brands, sample preservation, milk production processes and instruments.

Another challenge is that equations are difficult and costly to develop and maintain, requiring expert level personnel. In part, this is due to the fact

that it may be difficult to obtain the required number of samples covering a broad enough variety of bacterial loads, particularly in regions where milk quality is high.

Similarly, the impact of variations in milk production and collection practices, on milk flora, typically lead to differences in conversion equations. Although the industry has worked towards reaching a more unified approach to defining milk quality, especially since bacteria count is an essential payment parameter, international trade across countries and regions makes it very challenging to avoid the variations mentioned above. Considering this, the question remains whether conversion to CFU the way is still the way forward.

Conversion equations from different countries are indicated by different colors, clearly showing the lack of international harmonization.



Source: Bulletin of the IDF N° 511/2021: Guidance on the application of conversion equations for determination of microbiological quality of raw milk

LESS HASSLE. BETTER BUSINESS.

There is only one instrument that looks and performs better than a BactoScan™ FC+. The BactoScan™ 5.

BactoScan 5 exploits advances in instrument hardware and the latest in software and networking connectivity to achieve new levels of productivity

in raw milk analysis. With a capacity to analyze between 65 and 200 milk samples per hour, BactoScan 5 ensures a high throughput of milk samples, freeing up operator time while ensuring fast response to dairies and farmers.



BactoScan™ 5 features a modern, streamlined design that matches the FOSS milk testing portfolio, and is fully compatible with the existing and well-proven Conveyor 7 or Conveyor 5000.

Boost productivity with BactoScan™ 5

- Accurate results in 9 minutes
- Counting from 1,000 to 150,000,000 IBC/ml
- Flexible capacity: 65, 100, 130, 150 or 200 samples/hour
- Fewer steps and less chemical handling
- Bacteria Control Sample for quality assurance and good laboratory practice
- Reduced use of reagents
- Superior routine method for milk payment analysis
- FDA/NCIMS and MicroVal approved method

THE BEST TECHNOLOGY JUST GOT BETTER

BactoScan™ 5 is based on flow cytometry technology that enables fast and precise analysis of bacteria in raw milk. A mixture of milk and staining solution is surrounded by a sheath liquid and passed through a flow cell. In the flow cell, the stained bacteria are exposed to light of a specific wavelength. The stained bacteria then emit fluorescent light pulses at a different wavelength and the pulses are counted and displayed. The design of the

flow cell ensures that only one bacterium is detected at a time.

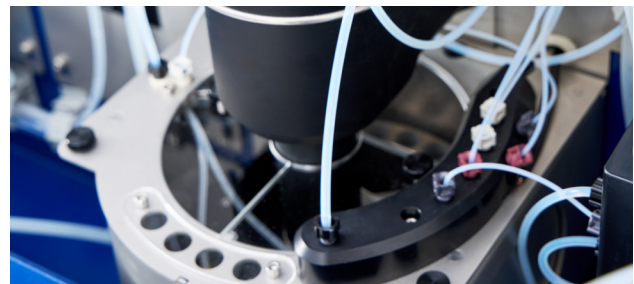
Prior to measurement all components in the milk, except for the bacteria, are broken down during an incubation period. Additionally, the bacteria clusters are separated into single bacteria, which are subsequently dyed with DNA specific staining solution, ethidium bromide.

Results in 4 steps

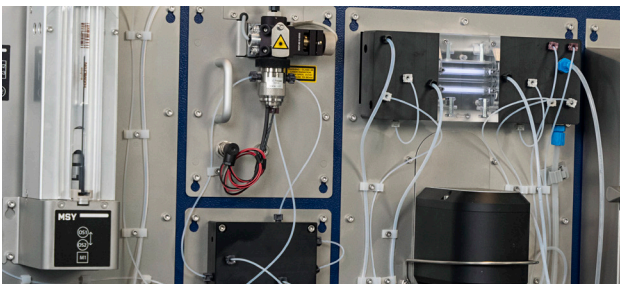
BactoScan™ 5 processes the sample in 4 steps.



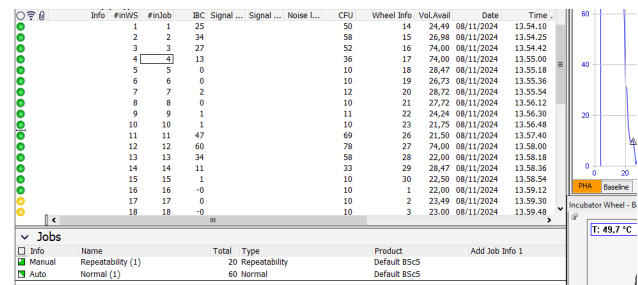
1. The sample is stirred and pumped into a tube and carefully sub-sampled.



2. The sample is dosed into an incubation wheel together with staining solution and enzyme for staining and homogenization.



3. The stained sample is passed through the flow cell and excited by a green laser. A lens and optical filter pick up the signals emitted by passing bacteria.



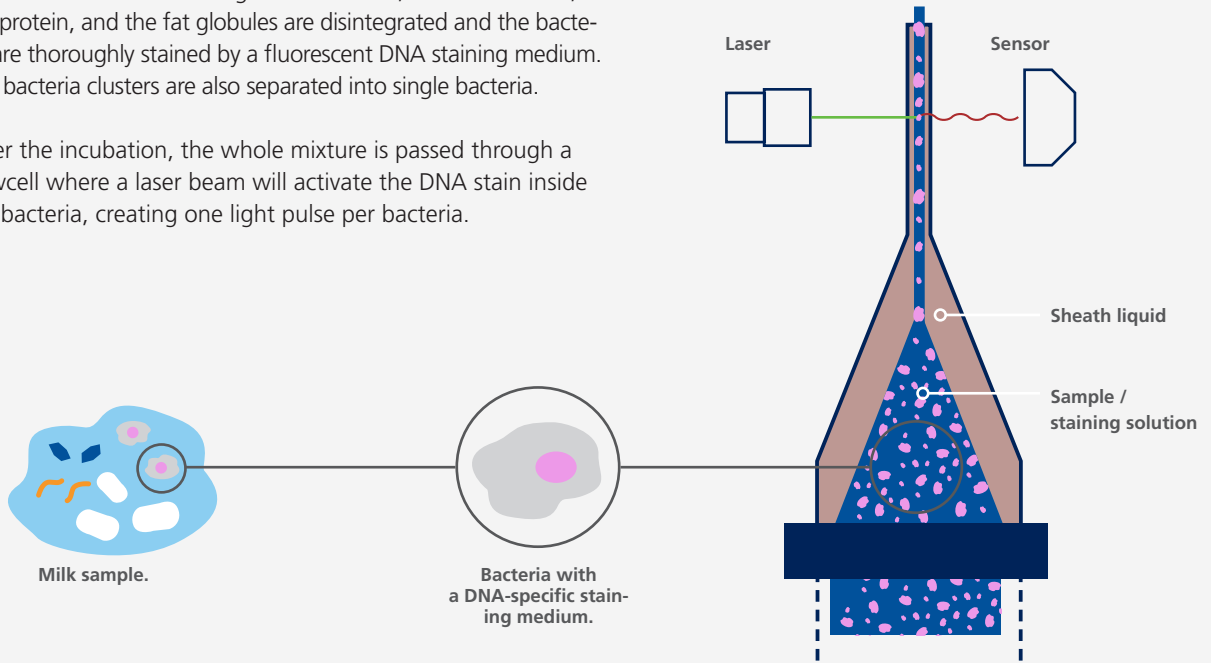
4. Results are sent to your LIMS via FossIntegrator™.

To ensure optimal results, automatic cleaning is initiated between each sample.

A look inside the BactoScan™ 5

The milk and an incubation reagent are mixed and incubated at 50°C for 8½ minutes. During this incubation, the somatic cells, the protein, and the fat globules are disintegrated and the bacteria are thoroughly stained by a fluorescent DNA staining medium. The bacteria clusters are also separated into single bacteria.

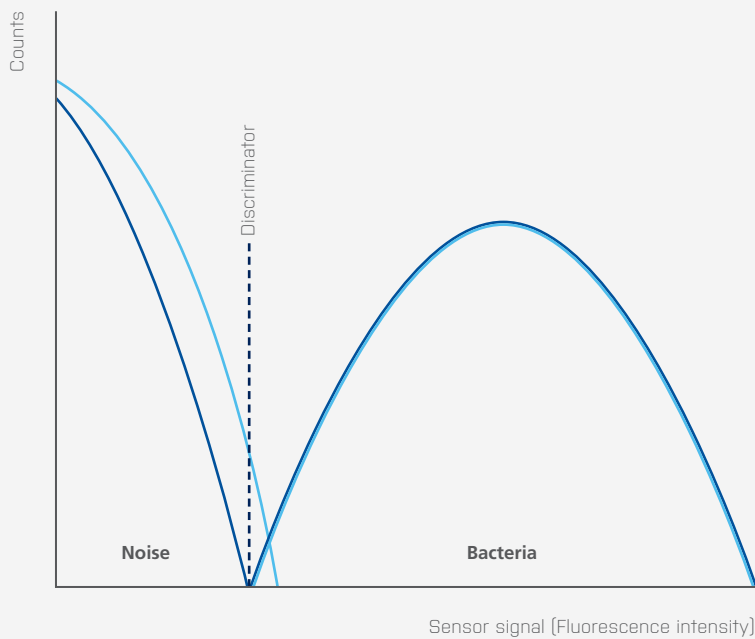
After the incubation, the whole mixture is passed through a flowcell where a laser beam will activate the DNA stain inside the bacteria, creating one light pulse per bacteria.



Superior signal-to-noise ratio

These light pulses are converted into electronic pulses, counted and expressed as Individual Bacteria Cells per ml. The latter happens in a Pulse Height Analysis diagram, where noise and bacteria can be discriminated from each other.

- BactoScan™ FC+ laser
- BactoScan™ 5 laser





IMPROVE OPERATIONAL EFFICIENCY

Preparing reagents typically involves many time-consuming steps, handling of hazardous chemicals and storage space for stock solutions.

All this has changed with BactoScan™ 5. Thanks to a re-design of the reagent handling process laboratories now have the opportunity to significantly increase operational efficiency.

Maximize efficiency. Minimize workload.

The BactoScan 5 reagent concept has reduced preparation steps, from mixing staining stock, rinse and sheath solutions, rehydration solutions

and enzymes, to a minimum. Ready to use reagent kits speed up the preparation phase, ensuring simple, fast and safe mixing of reagents.

- Free up operators to do other tasks
- Increase safety thanks to reduced handling of hazardous reagents
- Reduced operator error removes the risk of contamination
- Low reagent consumption and low waste for environmental protection
- Lower reagent costs per sample

SIMPLIFIED RINSE AND SHEATH CONCEPT



A simplified process makes it fast, easy and safe for anyone to handle the preparation of sheath liquid. This frees up time for highly trained operators and reduces the risk of error.

An additional benefit of this concept is that BactoScan™ 5 does not consume rinse/sheath while in standby, meaning that rinse/sheath solution lasts longer, making it more cost-efficient and reducing the need to store stock solutions.

BactoScan™ FC+

Steps in preparing reagents for **sheath**



Dissolve
buffer powder

Mix in
detergent

Dilute sheath
stock

Steps in preparing reagents for **rinse**



Add water

Mix in
detergent



TOTAL TIME
approx. pr. day.

45 min

BactoScan™ 5

Steps in preparing reagents for
combined **sheath & rinse** solution



Water

Mix in
rinse/sheath
concentrate

Rinse/sheath
solution



TOTAL TIME
approx. pr. day.

15 min

AUTOMATIC ENZYME DOSING

With BactoScan™ 5, operators no longer need to calculate the expected daily use of reagents thanks to automatic dosing of staining solution (dye) and enzyme.

This automated process minimizes handling and mixing steps, streamlining daily operations, saving operator time, and making staff onboarding faster and easier.

Additionally, incorporating the enzyme directly into the instrument offers a significant advantage: the dye mixed with enzyme typically has a short shelf life (about one day). By mixing the components on the go for each sample, the individual components, staining solution and enzyme, maintain longer stability.



BactoScan™ FC+

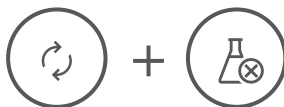
Steps in preparing reagents for enzyme solution



Prepare staining solution

Measure out daily volume

Add enzyme



Mix incubation reagent

Discard at end of day



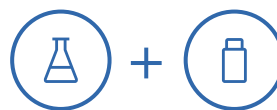
TOTAL TIME
approx. pr. day.

30 min

Solution expiry time: End of day

BactoScan™ 5

Steps in preparing reagents for enzyme inside



Prepare staining solution

Enzyme inside



TOTAL TIME
approx. pr. day.

15 min

Solution expiry time: Not applicable

IMPROVED SERVICEABILITY FOR BETTER UPTIME

With BactoScan™ 5 we have made it easier to service your instrument. Less time spent servicing your instrument means more time to run your daily operations. Benefit from improved cleaning procedures, better surveillance, instrument diagnostics and troubleshooting supported by FOSS global service and industry-leading digital services

- Automated cleaning ensures high uptime and reduced operator time.
- Prevent liquid from running out during analysis and avoid the need to discard sample batches with intelligent warnings.
- Fast processing of errors ensures uptime and protects data with industry leading surveillance, diagnostics and troubleshooting.



Similar to the rinse/sheath solution the preparation of control samples has been simplified from a complex process involving many steps, including the handling of Boric acid, to a simple matter of mixing the FOSS rehydration kit, into a 5 l container of demineralized water.

With BactoScan™ 5, weighing, and preparation of stock solutions is avoided. The ready-to-use rehydration kit can be used for 3 different control samples: blank, bacteria control samples (BCS) and particle control samples (PCS). This also reduces the need to prepare a separate solution for each control sample, replacing them with just one reagent.

BactoScan™ FC+

Steps in preparing blank & solvent for PCS



Dissolve buffer powder

Mix in detergent

Dilute sheath stock

Steps in preparing rehydration of BCS



Weight reagents

Mix in preservation stock

Mix rehydration liquid


TOTAL TIME
approx. pr. day.
20 min

BactoScan™ 5

Steps in preparing blank, solvent for PCS & rehydration of BCS



FOSS supplies ready to use kit reagents

Water

Rehydration solution for BCS, PCS and Blank


TOTAL TIME
approx. pr. day.
5 min

OPERATE RESPONSIBLY

While the BactoScan™ 5 reagent concept provides a massive boost to the efficiency of daily operations, it also reduces the use of reagents adding new levels of sustainability to your operations.

The unique reagent concept ensures simple, safe and fast reagent handling, reducing both operator dependency and risk of error, while low reagent consumption and reduced waste contribute to improved environmental sustainability.

Reduce handling of hazardous chemicals

The simplified reagent process and automated enzyme dosage reduces the use of hazardous chemicals throughout your daily testing operations.

The solution used for preparing blank and control samples has been replaced by a re-designed rehydration kit, that substitutes boric acid with ready-to-use rehydration powder and tablets. This reduces the risk of errors and avoids the potential waste and associated cost of discarding excess reagents.

Similarly, the rinse/sheath solution, which is easy to prepare, can be made in larger batches and stored

on the reagent trolley, reducing preparation time, risk of error and waste.

Innovation that helps you meet your sustainability goals

The BactoScan 5 reagent concept reduces reagent use by 15-20% compared to previous BactoScan generations. No reagents are used during stand-by mode, and the amount of rinse/sheath used during analysis has been reduced.

Automatic dosing of the staining solution and the enzyme at each sample intake, ensures longer life of each individual component, reducing waste at the end of the day and ensuring that results are always stable.

Additionally, the rehydration kit, providing one reagent for 3 control samples, reduces waste of surplus reagents. Combined with the elimination of boric acid, these improvements allow laboratories to reduce the use of chemicals and waste, making it easier to improve sustainability goals.

Enhance your operator safety

The simplified reagent process and automatic enzyme dosage significantly reduces the handling of hazardous chemicals, allowing for improved operator safety and reduced risk of errors.

At the same time, BactoScan 5 offers a reduced noise level that pauses completely in standby, contributing to a less stressful working environment.

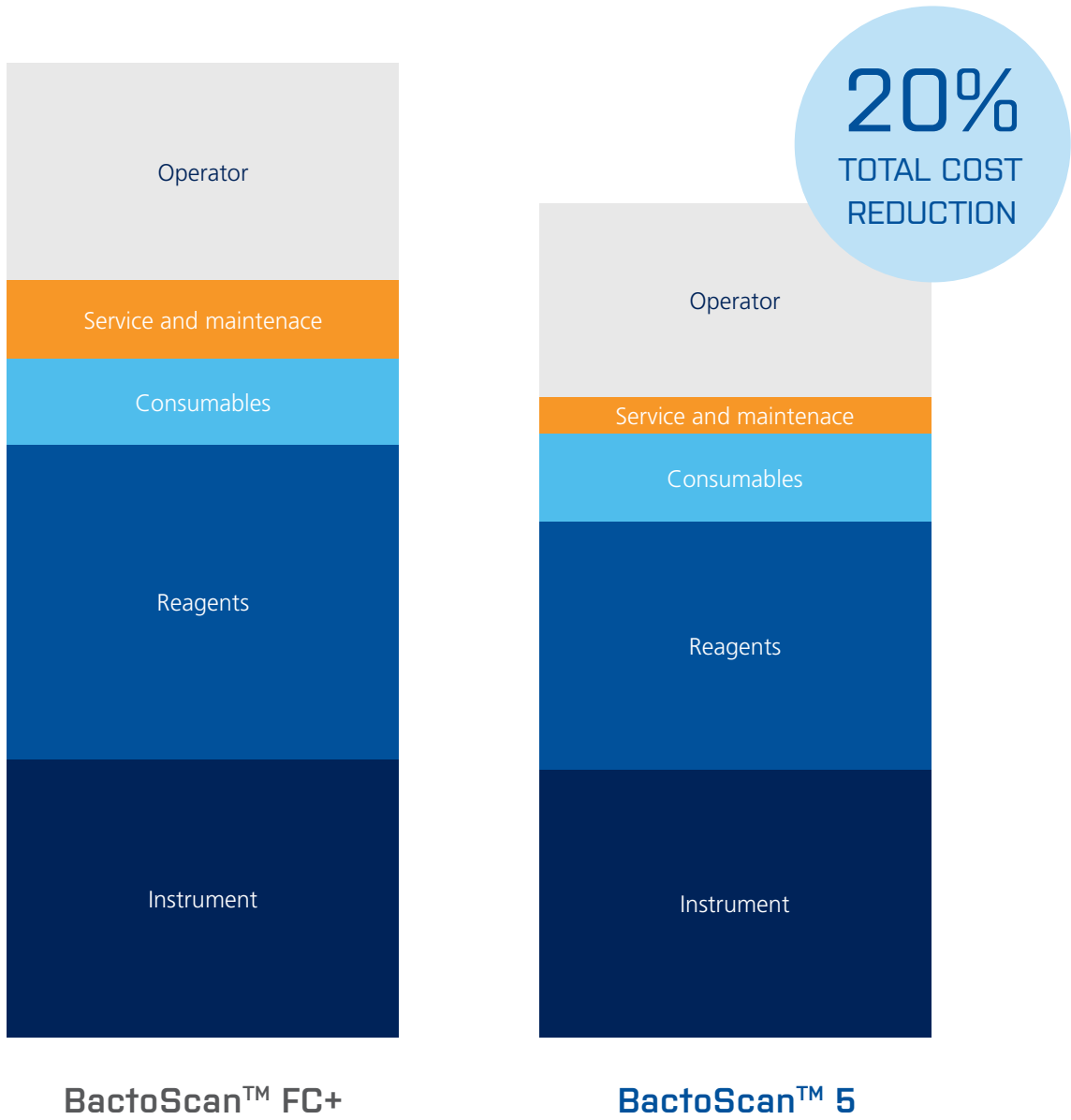
AVOID CARRY-OVER WITH UNIQUE SELF-CLEANING PROGRAM

FOSS has developed a unique integrated cleaning system, that cleans both the stirrer, pipette, and incubation wheel between each intake, thereby reducing the carry over to less than 0.5 %.

A carry-over test is a part of the quality assurance and checks that the instrument is able to purge a sample completely through the system without affecting the next sample. The test complies with the ISO/IDF standard.



LOWER YOUR COST OF OWNERSHIP



Upgrading to BactoScan 5 means significant savings due to a new reagent concept, reduced use of reagents, and reduced operator time. At the same time increased efficiency and uptime means that you can increase your throughput and ensure maximum profit from your operations.

Minimize reagent use and waste

BactoScan 5 enables laboratories to reduce the use and cost of reagents. The new reagent concept focused on automatic enzyme dosing, ready-to-use reagent kit and simplified rise/sheath solu-

tion means that you reduce the need to discard a surplus of prepared reagents and solutions. In addition to this, BactoScan 5 does not use reagents during stand-by, all in all leading to a lower cost of ownership.

An added benefit of this concept is the improved efficiency that frees up operator time to prepare and process more sample batches, enabling labs to invoice even more samples per hour.

Reduce service and maintenance expenses

BactoScan™ 5 offers improved hardware features and cabinet design that help cut down on maintenance and repair costs:

Redesigned staining solution filter is easy to change with a simple lever function

Improved flow cytometer

A modular design makes it easier to take out each module for service

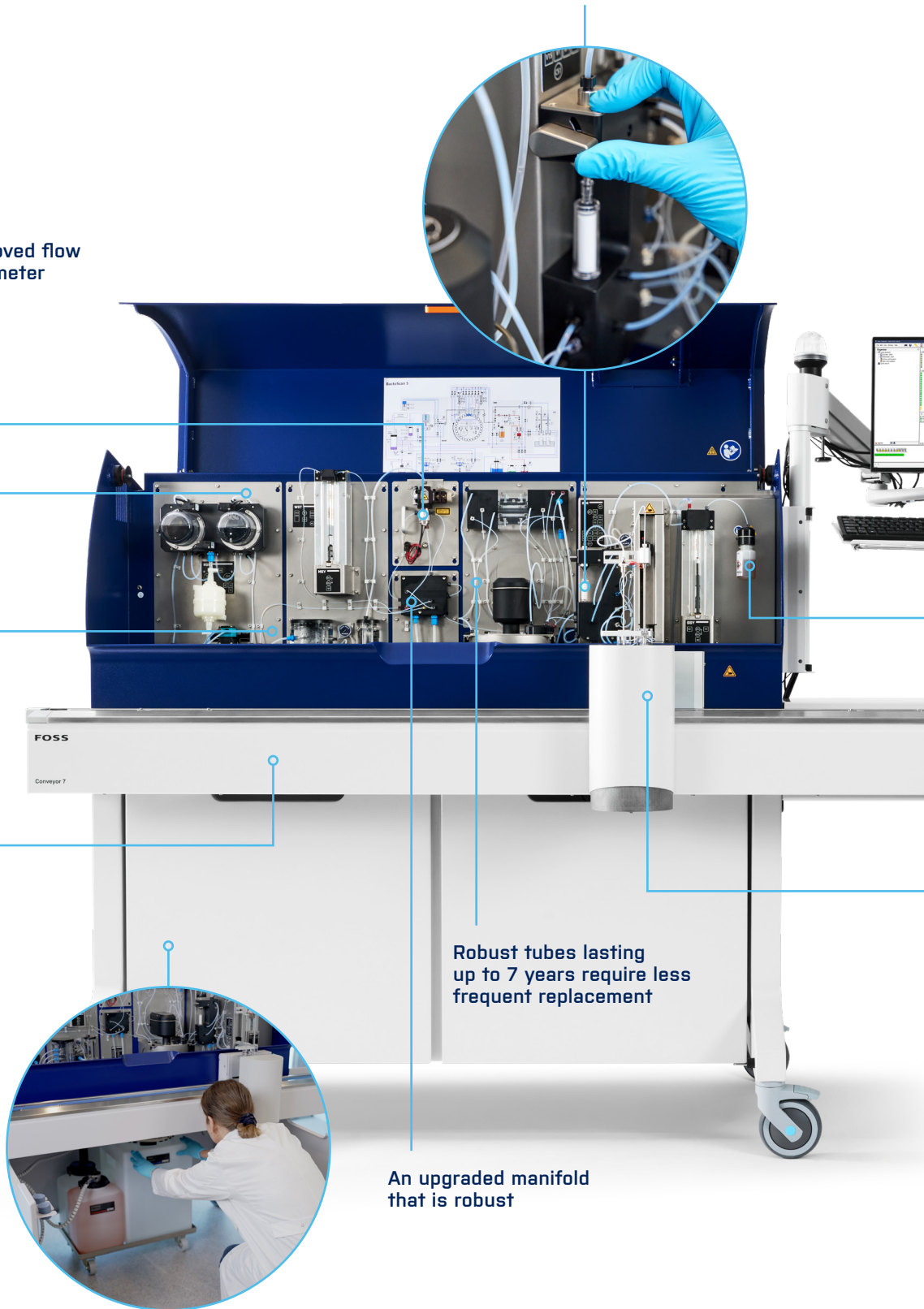
Instrument components are made using longer lasting materials

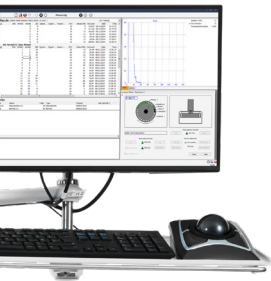
Automatic throughput and no use of compressed air with Conveyor 7

Robust tubes lasting up to 7 years require less frequent replacement

An upgraded manifold that is robust

Practical storage of reagents





Automatic enzyme dosing



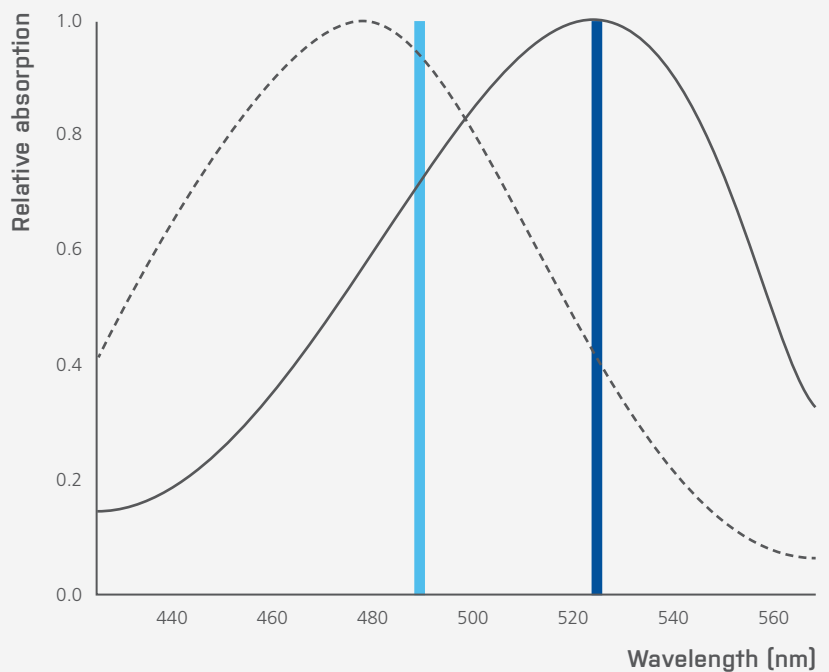
Flexible capacity.
Choose between running
65, 100, 130, 150, or 200
samples/hour

Improved flow cytometer

The BactoScan™ 5 laser technology utilizes green light, that is specifically designed to align with the absorption profile of ethidium bromide. This precise match enhances the signal from the bacteria, resulting in clearer and more accurate readings compared to previous BactoScan generations.

Additionally, the focus of the laser has been improved, contributing to a superior signal-to-noise ratio, ensuring that the data is more reliable. Furthermore, this advanced laser reduces sensitivity to somatic cell count (SCC), making it a robust tool for accurate detection of individual bacteria.

--- EtBr - background ■ BactoScan™ FC+ laser
— EtBr - bacteria ■ BactoScan™ 5 laser



The absorption spectrum of ethidium bromide shifts to longer wavelengths when going from the background environment (dashed black line) to being bound to DNA inside a bacterium (solid black line). The new BactoScan 5 laser therefore has a better signal-to-background ratio than the BactoScan FC+ laser.



Ensure high uptime at a lower cost

Instrument downtime is a major concern for any laboratory. BactoScan™ 5 offers the highest possible uptime at a lower cost with a preventive maintenance agreement.

Supported by a connected SmartCare™ service solution, uptime is safe-guarded and troubleshooting alleviated, setting you free to do your job in pursuit of improved laboratory efficiency. In the event of a breakdown, BactoScan 5 has been upgraded with a modular design that is easy to fix on the spot using automatic troubleshooting and PM kits, resulting in faster service and less downtime. Additionally, many components such as tubing, have been updated with robust and longer lasting materials that significantly reduce the need for regular replacement. These improvements minimize the need to replace expensive parts, reducing downtime and associated costs to a minimum.

Know that your BactoScan™ 5 solution is always delivering consistently accurate results with exceptional performance and uptime supported by:

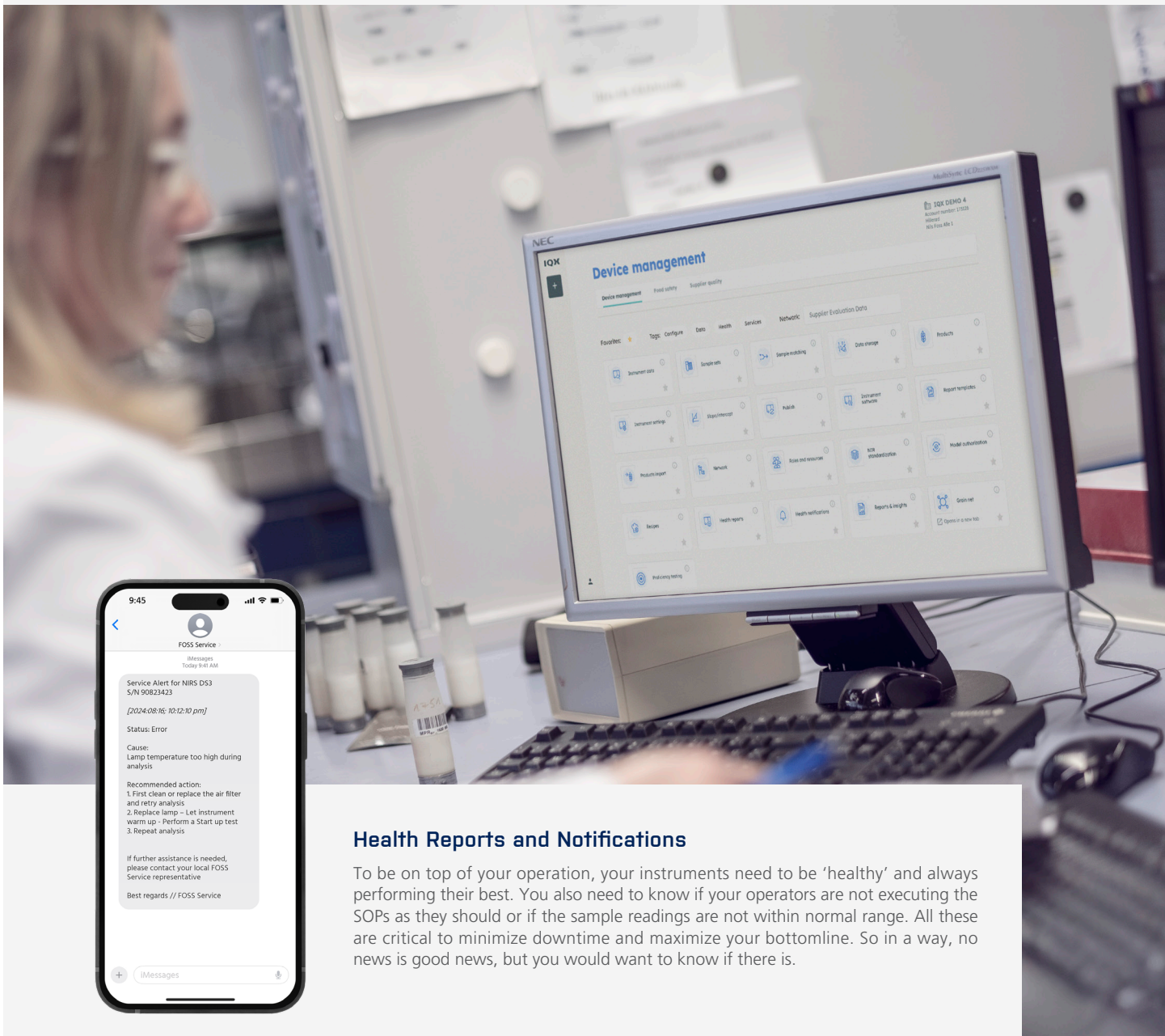
- Intelligent diagnostics
- Remote service and support
- PM kits for fast and easy repairs
- Longer lasting components
- Instrument health reports

Always stable, high uptime with a connected service solution

With BactoScan™ 5 you can benefit from FOSS IQX™ software solutions that allow you to boost productivity and evolve your laboratory operations. Automatic backup and reporting ensure that the data is safe, traceable and accessible from anywhere. Log in to your PC to check results, monitor instrument performance and get access to reports.

FOSS IQX™

A native software complement to your new BactoScan™ 5. FOSS IQX helps you make informed decision for improving quality control, regulatory compliance, and operational excellence. The IQX Device Management workspace helps you better monitor your SOPs, overall instrument health, optimize your uptime, and more importantly, help you stay in control. Explore Device Management and our other workspaces on [IQX.net](https://www.foos.com/iqx.net).



Health Reports and Notifications

To be on top of your operation, your instruments need to be 'healthy' and always performing their best. You also need to know if your operators are not executing the SOPs as they should or if the sample readings are not within normal range. All these are critical to minimize downtime and maximize your bottomline. So in a way, no news is good news, but you would want to know if there is.

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