

BactoScan™ FC+

The approved rapid method for determination of total bacteria in raw milk



Based on the measurement of Individual Bacteria Count (IBC), BactoScan™ FC+ gives an accurate determination of the hygienic quality of raw milk with a capacity of testing up to 200 samples per hour. The FDA/NCIMS accepted method delivers results in minutes, allowing farmers, milk testing laboratories and dairies to take action to preserve and enhance hygienic quality of the milk supply.

Supported by a dedicated Foss Integrator™ software, which provides a wide range of quality assurance and GLP features. Foss Integrator shares the same interface for all CMT instruments.

Sample	Parameters
• Milk types: cow, goat, sheep and buffalo milk	Individual Bacteria Count (IBC/ml)



Superior accuracy through Individual Bacteria Count

BactoScan™ FC+ measures the hygienic quality of milk by analysing bacteria in raw milk. As the automated BactoScan™ FC+ counts the total bacteria as single cells and not clusters, it gives a uniform high accuracy of results. BactoScan™ FC+ can analyse raw milk from various species and the samples can be analysed directly without prior heating or dilution. Analysis on cold samples reduce the risk of bacteria growth before the test and save time in sample handling, as well as cost of water bath. And unlike traditional methods such as plate count, BactoScan™ FC+ reduces the possible influence caused by the operator to absolute minimum. All ensuring superior performance.

High capacity with confidence

The new BactoScan™ FC+ can analyse up to 200 milk samples per hour to meet the requirements of all milk testing laboratories. This high performance capacity enables a high throughput of milk samples, which offloads labour force for other purposes and provides instant results with fast response to farmers. The repeatability and reproducibility of this automated method is excellent compared to plate count methods. In addition, BactoScan™ FC+ employs a unique self-cleaning program that is proven to minimize carry-over contamination from previous samples.

Why choose FOSS?

For decades, FOSS has worked side by side with milk testing laboratories with the goal of adding value to the central milk testing business.

Often the first with groundbreaking innovations in analytical technology, we aim to keep you a few steps ahead of the game with new analysis options for improved business opportunities. For instance, FOSS dedicated analytical solutions have proven significant for dairy-herd-improvement and regulatory purposes of milk testing, standardisation in dairy production and verification of end-product quality.

Today, trends such as increasingly sophisticated consumer tastes and the relentless pressure for profit improvement make FOSS dedicated analytical solutions more relevant than ever. They provide convenience, speed and labour savings, while delivering high analytical capacity and low cost per sample. Common issues such as the need for analytical results with minimal operational concerns about calibration, usability and instrument uptime are constantly kept in mind in the design of any FOSS solution.

Solutions for central milk testing cover compositional analysis, somatic cell count and hygienic quality of raw milk and are provided in a flexible solution framework with a high degree of choice according to your business.



BactoScan™ FC+ highlights:

- Automatic determination of raw milk hygienic quality by Individual Bacteria Count
- Instant results in 9 minutes
- High capacity up to 200 samples/hour
- FDA/NCIMS approved
- Unique reagent concept
- Bacteria Control Sample for quality assurance and GLP
- Counting from 1500 CFU/ml to 10 mill CFU/ml
- Easy and safe to operate
- Superior routine method for payment analysis

Easy to integrate in milk testing laboratories

BactoScan™ FC+ uses the same efficient conveyor system and Foss Integrator™ software platform as other FOSS instruments for milk testing laboratories such as MilkoScan™ FT+, Fossomatic™ FC+ and CombiFoss™ FT+ . This eases training of laboratory staff and facilitates data transfer, storage and handling for more efficient laboratory operations.

The only automated method with U.S. FDA/NCIMS* approval

The BactoScan™ FC+ is the only FDA/NCIMS approved rapid electronic counting method and complies with ISO/IDF guidelines**. It has become the industrial standard for counting total bacteria in many countries all over the world, and in the EU more than 75% of all milk supplies are paid based on BactoScan™ results. Dairy authorities have seen a significant improvement in milk quality shortly after introducing the BactoScan™ method.

* U.S. Food and Drug Administration / National Committee of Interstate Milk Shippers

**ISO 16297|IDF 161 Milk - Bacterial count - Protocol for the evaluation of alternative methods.

ISO 21187|IDF 196 Milk – Quantitative determination of bacteriological quality – Guidance for establishing and verifying a conversion relationship between routine method results and anchor method results

Traditional plate count method versus BactoScan™ FC+ farmer and dairy benefits

Although pasteurisation kills the majority of bacteria, their metabolites may cause off flavours. Plus, enzymes continue their activities resulting in product defects and reduction of shelf life. Catching hygiene breaches early is imperative for minimizing the impact on milk quality.

Because the traditional plate count method requires two-three days of incubation, hygienic problems on the farm may go undetected for days, making corrective actions more difficult and production losses larger than necessary.

In comparison, the BactoScan™ FC+ method delivers a result in nine minutes. 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.

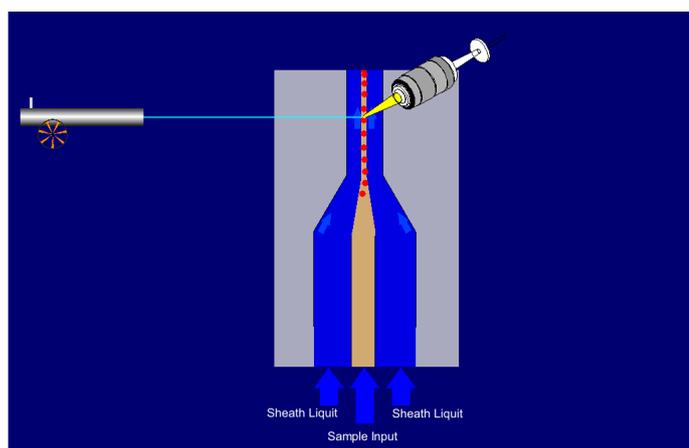
Further, monitoring the incoming raw milk at dairies means that serious contamination can be detected instantly. Poor quality milk can be rejected and only the best suited milk will be used for dairy production. The fast BactoScan™ FC+ response to farmers gives dairies a direct economic benefit by enabling higher flexibility in collection, transportation and production.

Technology

BactoScan™ FC+ is based on flow cytometry technology that enables precise and instant milk bacteria analyses.

Flow cytometry is a technique that counts bacteria cells. The principle behind flow cytometry is quite simple: a suspension of cells is stained and forced through a capillary tube, which is illuminated in front of microscope objective. Every passing cell is registered by photo electronics attached to the microscope.

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 medium, ethidium bromide. All the reagents involved are automatically filtered directly prior the application to eliminate the risk of contamination from other sources than the milk.



Sample in flow cell

A precise syringe is used to pass the sample through a flow cell, presenting the bacteria one by one to a fluorescent light beam from a laser source. The stained bacteria emit red light with one light pulse for every bacteria passing the beam.

The fluorescent light is detected by a highly sensitive detector (Photo Multiplier Tube - PMT), which gives electronic impulses. The electronics count the pulses and display them in a pulse height analysis (PHA) diagram on the PC monitor.

Avoiding carry-over

FOSS has developed a unique self-cleaning program to limit carry-over contamination from previous samples. Optionally, the effect of carry-over between the samples may be reduced by a mathematical compensation that is made automatically. Such compensation is based on observed carry-over between the samples and can be deducted from the results.

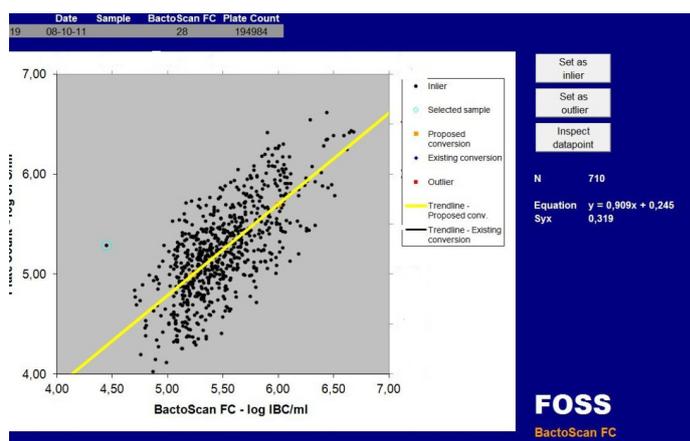
Even the uncompensated carry-over is extremely low for the BactoScan™ FC+ and proven to be below 0.5%, which is superior to the 1% required by the ISO/IDF. A carry-over test is a part of the quality assurance and checks that the instrument is able to purge a sample completely through the system without affecting the next sample. The test complies with the ISO/IDF standard.

IBC to CFU conversion

BactoScan™ FC+ measures Individual Bacteria Count and displays results in IBC. However, many laboratories are obliged to present their results in Colony Forming Units (CFU), which can be obtained by a plate count method. Consequently, a conversion table has to be created to convert from IBC to CFU.

The BactoScan™ FC+ software includes a Guided Conversion Tool – an easy and rapid software tool to develop a robust conversion table between IBC and CFU

- Respect to ISO 21187: 2004 (IDF196: 2004)
- Automatic calculation of agreement (Sy,x) with CFU
- Easy trouble shooting and outliers traceability
- Excellent storage for data generated over time
- Simple and time effective use
- Enables to meet the governmental and legislative requirements
- Enables use of comparable grading limits for payment schemes



Conversion graph: IBC/CFU

“BactoScan™ FC+ carry-over below 0.5% which is superior to 1% required by the ISO/IDF”

Special feature for difficult milk samples

Options are available to handle milk samples from, for example, sheep and goat which can be subject to high concentrations of somatic cells - like in goats milk at the end of lactation. This induces background noise leading to high readings on the BactoScan™ FC+ – often due to increased viscosity of the milk sample, which in turn will make the flow of the sample film through the flow cell unstable. The influence of the background noise typically starts > 4 mill. somatic cells/ml.

The Enhanced mode option stabilizes the flow of the film through the flow cell. The measuring speed of milk will be reduced by either 50% with the mode 1, or 75% with the mode 2 without affecting the speed capacity of the instrument.

Foss Integrator software platform

Foss Integrator is a shared software platform supporting other FOSS milk testing solutions. The same user interface, the same conveyors, bar code readers etc. can be used throughout the laboratory. This eases training of laboratory staff and facilitates data handling, transfer and storage. Uniform software provides flexibility in the laboratory.

Further, context sensitive help available via Foss Integrator software provides easy and quick solutions and answers, as well as provides an excellent tool for quality assurance.

Quality control tools

Together with the BactoScan™ FC+ you get a number of tools which provide excellent help in recording quality assurance and following the Good Laboratory Practice:

The Bacteria Control Sample (BCS) ensures the correct performance of the instrument and reagents throughout the working day and standardises instruments within and between laboratories. The BCS is made of freeze dried monoculture harmless bacteria with a known count and specific Pulse Height Analysis (PHA) curve.

The Particle Control Sample (PCS) enables monitoring of the technical status of the instrument. It is necessary when adjusting the optical system and is mainly a service tool for maintenance and repair. It is made of dyed fluorescent particles with a well defined PHA curve

A Frozen Milk Standard is used to monitor the accuracy and stability of the instrument. The frozen milk standard is made of good quality raw milk with a known bacteria count. When

applied on regular basis, the milk standard plays a crucial role in quality assurance.

Easy reagents handling – in minutes with highest security

The unique reagent concept ensures simple, safe and very fast reagents handling, which reduces the operator's dependency. Low reagents consumption and low waste contribute to the environmental protection. By the process of internal filtration of reagents, the time is saved and the risk of contamination is eliminated.

Unique reagent concept:

- Quality assured with certificates for all reagents*
- Simple, fast and safe mix of reagents
- Minimum time used for reagent preparation and less operator dependency
- Low reagent consumption and low waste for environmental protection
- Low reagent costs per sample
- Internal filtration of reagents prior to use, saves time and removes risk of contamination

*Available at the FOSS homepage



Specifications

Performance

Repeatability*:		
Range (IBC/μl)	S_R (log-units)	Typical S_R (log units)
10 – 50	0.07	0.06
51-200	0.05	0.04
>200	0.04	0.02
Entire range	0.05	

Reproducibility* (between instruments):		
Range (IBC/μl)	S_R (log-units)	Typical S_R (log units)
10 – 50	0.11	0.08
51 –200	0.07	0.06
>200	0.06	0.04

Carry-over effect:	< 0.5 % (uncompensated)
Working factor:	Standard 300, (optionally: 95, 600 and 1200)
Accuracy:	Typical $S_{y.x}$ < 0.25 log units in the entire measuring range
Reference or anchor method:	Standard Plate Count (SPC) (IDF Standard100B:1991)

*For the performance on sheep and goat milk please refer to the Application Note 3511

Installation requirements

Feature	Specification
Dimensions	70 x 140 cm (without conveyor) 85 x 195 cm (with Basic Conveyor*) 85 x 260 cm (with Conveyor 4000*)
Weight	197 kg (without conveyor) 205 kg (with Basic Conveyor*) 250 kg (with Conveyor 4000*)
Space requirements	Approx. 2 x 4.5 meters
Power supply	110 - 240 V AC
Power consumption	50VA stop, max 2000 VA
Water supply for preparation	Purified water (<5 μS/cm ³)
Air (for Conveyor 4000*)	0.2 N litres/min at 4.0 – 7.2 bar
Waste	Approx. 8 litres per hour
Ambient temperature	15 – 33 °C (59-91.4 F)

Application data

Capacity BactoScan FC+:

Models: 65H, 130H, 200H = 65, 130, 200 samples per hour

BactoScan™ FC+ Semiautomatic is only available at a capacity of 65 samples per hour.

This version does not include Conveyor and Stirrer system

Analysis time:	9 minutes
Sample intake:	approx. 4.5 ml
Sample temperature:	2 – 42°C (35.6-107.6 F)
Sample quality:	Raw milk of normal composition and good quality. Unpreserved or preserved with azidiol

Data output

Real-time display/print-out, storage on hard disk.

Host transmission (RS232) and PC network transmission (TCP/IP).

Data export using CSV files, CS83 protocol or XML.

Standard equipment

Basic analyser incl. table and reagent containers, PC, software, Conveyor 4000, Basic Conveyor*.

Optional equipment

Printer, extra reagent containers, *ID bar code laser scanner, *2D reader, *ID bottle rotation, *Conveyor 4000, *Conveyor extensions, *Output buffer, *Sample racks.

Standards and Approvals

BactoScan™ FC+ is CE-labelled and complies with the following directives and regulations:

- EMC (ElectroMagnetic Compatibility) Directive 2004/108/EC
- LVD (Low Voltage) Directive 2006/95/EC
- Machinery Safety Directive 2006/42/EC
- Regulation (EC) 1272/2008 on classification, labelling and packaging of substances and mixture, CLP (EC)
- WEEE Directive 2002/96/EC
- Packaging and packaging waste Directive 94/62/EC
- REACH 1907/2006/EC

BactoScan™ FC+ technology complies with:

- FDA/NCIMS approved
- ISO/IDF standards, AOAC Number of national approvals e.g.:
Germany: Bundesanstalt für Milchforschung, France: Ceca Lait.

*Semi-automatic version does not include conveyor.

Installing a conveyor on Semi-automatic version requires upgrading of the analyser.

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