Changing Food Microbiology

MALDI Biotyper®

AOAC-OMA & ISO 16140-part 6 validated

Innovation with Integrity

GP

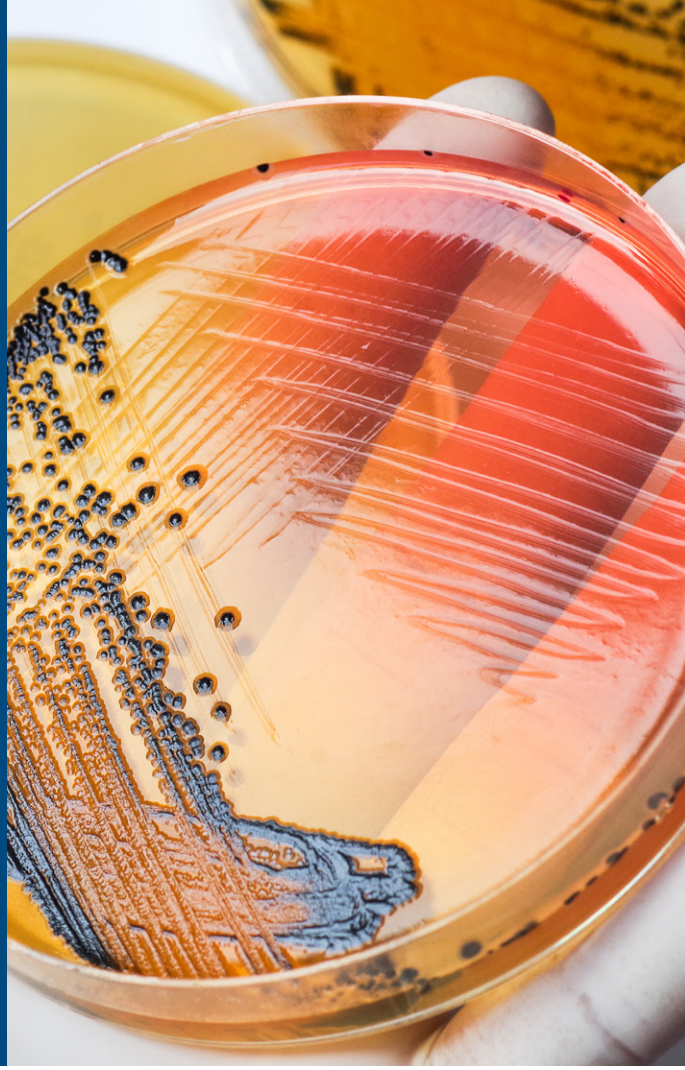
In food microbiology, speed and accuracy matter

The MALDI Biotyper can be used in microbiological laboratories as a reliable rapid test method for environmental and hygiene monitoring, food and ingredients quality control, plus food safety related analytical questions including confirmation of foodborne pathogens.

The versatile system can also be applied for analysis of starter strains, production strains, spoilage organisms, for detection of animal or plant pathogens and for water analysis.

On top of that, plenty of research topics benefit from using the MALDI Biotyper, such as projects on microbiomes, probiotics, beverages or new food.

The MALDI Biotyper offers quick identification of bacteria, yeast and molds in minutes, starting from colony material. Conveniently, all gram-positive and gram-negative bacteria, yeast and molds can be measured in parallel, in one run; there is no need for multiple assays or different reaction plates.



MALDI Biotyper®

Confirmation and identification of microorganisms by their molecular fingerprint

The MALDI Biotyper identifies microorganisms using MALDI-TOF (Matrix-Assisted Laser Desorption/Ionization Time-of-Flight) Mass Spectrometry to determine the unique proteomic fingerprint of an organism. The characteristic spectrum pattern of this proteomic fingerprint is used to reliably and accurately identify a particular microorganism by matching thousands of reference spectra from microorganism strains, starting from colony material.
Integrating the MALDI Biotyper into routine testing workflows results in a significant consolidation of resources, as it replaces multiple traditional and biochemical identification methods, and eliminates the burden of multiple steps, workstations and metrology requirements of numerous extraction kits, PCR assays or DNA sequencing.

Additionally, the MALDI Biotyper delivers reliable information on species level, prior to further cluster analysis and strain discrimination which can be performed by Bruker's IR Biotyper®, by sequencing or another DNA fingerprinting technique.

Meeting the demands

Typical food industry bacteria, yeast and molds, covered by the MALDI Biotyper

Milk & Dairy
Lactococcus, Lactobacillus, Staphylococcus, Listeria, Salmonella, Cronobacter, Brucella

Meat & Egg
Salmonella, Campylobacter, E. coli, Listeria, Staphylococcus, Yersinia

Fruits & Vegetables
E. coli, Listeria, Leuconostoc, Salmonella, Enterobacter, Klebsiella

Cocoa & Confectionary
Salmonella, E. coli, Staphylococcus, Aspergillus, Penicillium

Beverages
Alicyclobacillus, Lactobacillus, Pediococcus, Zymomonas, Candida, Saccharomyces

Drinking Water
Legionella, E.coli, Pseudomonas, Enterococcus, Alcaligenes, Lelliottia, Campylobacter

Probiotics and Starter Cultures
Lactobacillus, Bifidobacterium, Streptococcus, Saccharomyces, Propionibacterium

Veterinary
Salmonella, Staphylococcus, Streptococcus, Candida, E. coli, Campylobacter

Flour & Milling
Salmonella, E. coli, Bacillus, Aspergillus, Penicillium

Seafood
Listeria, Vibrio, Salmonella, Streptococcus, Aeromonas

A simple procedure for a sophisticated and fast platform

Bacteria, yeast or molds: one workflow for all

The MALDI Biotyper system workflow has been designed to be efficient and easy. No previous experience with mass spectrometry is required. As shown, the straightforward, fully traceable workflow requires only a few simple steps to generate high quality micro-organism identifications. Typically, no more than one single isolated colony from a culture is required.

The hands-on time per isolate is only 20 seconds for nearly all microorganisms.

Our dedicated microbiology software automates the process of acquiring the mass spectrum and performing the match against the extensive reference library. The results, presented using a 'traffic light' color scheme, are effortless to interpret.

The MALDI Biotyper simplifies and shortens the confirmation and identification step, facilitating and harmonizing the workflow with only one system.

Faster than ever

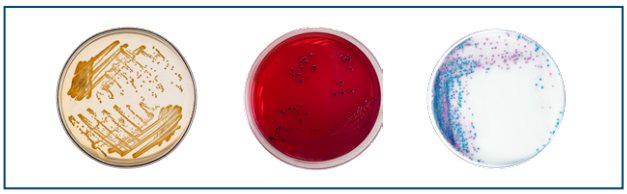
The new MBT Compass HT software dramatically shortens the time-to-result; analysis of 95 isolates and 1 QC sample results in a complete confirmation/identification report within ~5 minutes.

The short time-to-result allows preparation and analysis of a full 96-spot target plate in less than 30 minutes.

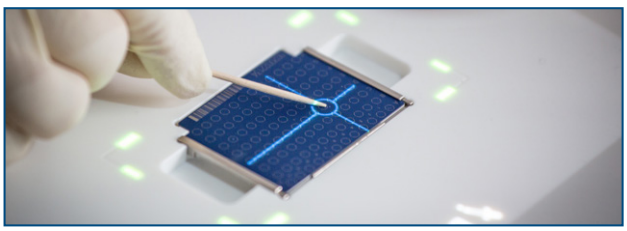
Sample preparation hands-on time:
- 1 isolate ~20 seconds
- 95 isolates < 20 min

System analysis time to result:
- 95 isolates + 1 QC sample ~ 5 min

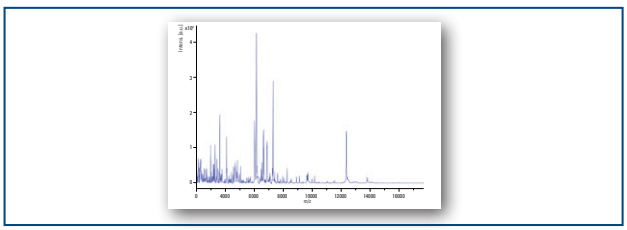
Add target plate to a MALDI Biotyper project list



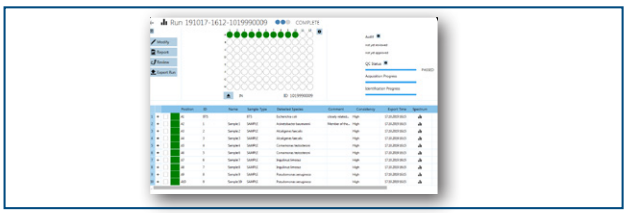
Select an isolated colony



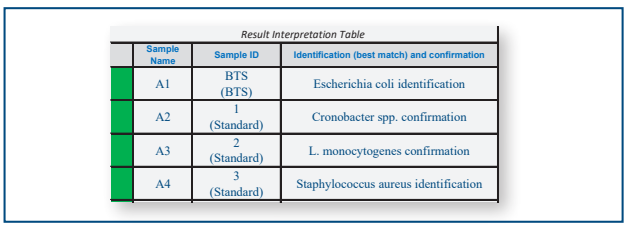
Transfer sample onto the target plate and add matrix



MALDI-TOF spectrum automatically generated by the software



Spectrum instantly matched against the reference library to give identification



Result Interpretation Table

	Sample Name	Sample ID	Identification (best match) and confirmation
	A1	BTS (BTS)	Escherichia coli identification
	A2	1 (Standard)	Cronobacter spp. confirmation
	A3	2 (Standard)	L. monocytogenes confirmation
	A4	3 (Standard)	Staphylococcus aureus identification

Easy result reporting with "traffic light" color scheme

Hands-on time:
1 isolate ~20 seconds, 95 isolates + 1 QC sample < 20 min

95 isolates + 1 QC sample ~5 min

The core of the MALDI Biotyper

A continuously updated reference library

The principle behind identification of microorganisms with the MALDI Biotyper is the comparison of the mass spectrum of an unknown organism with a library of reference mass spectra. As the extent and quality of this library is key to successful identification results, Bruker is fully committed to the continuous development of the reference library. An active program of reference spectra generation culminates in regular library updates for MALDI Biotyper users. These updates focus on strains from various origins being primary production, raw materials and food products, environmental samples, veterinary samples etc.

Our mighty solution for filamentous fungi

The MALDI Biotyper is perceived as the most promising alternative for molds identification. A dedicated MBT HT Filamentous Fungi Module, including a software module and a specific reference spectrum library, is available to facilitate the identification of this group of microorganisms.
Bruker's simple and fast Mycelium Transfer (MyT) method can be used in most of the cases, when front mycelium is clearly visible and can be harvested easily. Hence, sample preparation is most often very straightforward, resulting in high identification success rates, directly from agar.

Identification of highly pathogenic microorganisms

A dedicated small library is available for identification of highly pathogenic species such as *Brucella melitensis*, *Vibrio cholerae* and *Clostridium botulinum*.

Create your own libraries and run your data comparison

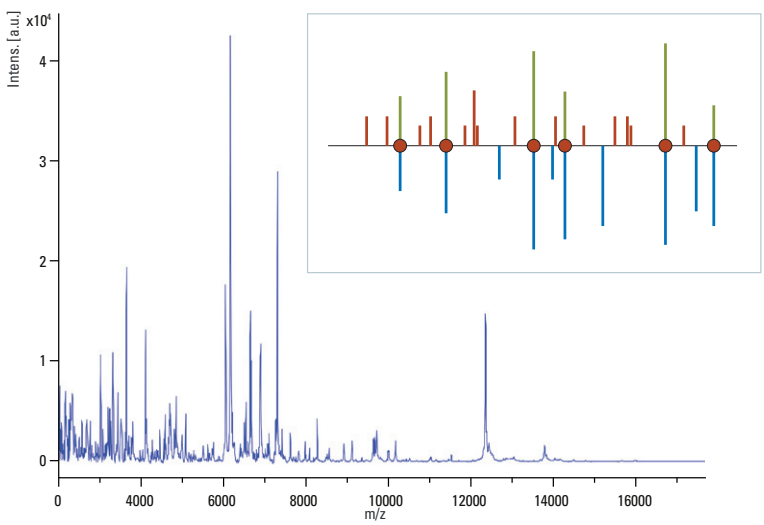
Laboratories that need to create their own libraries can easily compile customized microorganism entries by software tools and share or export libraries. These might be libraries with site-specific isolates and/or entries for important starters used for production.

Own libraries for non-microbial samples

Many laboratories have created their own libraries for identification of meat, seafood or insect species, or even for e.g., detection of different types of milk sources in cheese.

Taxonomy becomes easy

The metadata of the MALDI Biotyper Reference Library facilitate the access to taxonomical information, such as synonyms and taxonomical modifications.



The main spectra concept capturing true biological variability

Reference library entries in the MALDI Biotyper system are stored as Main Spectra (MSP). These MSPs are based on multiple measurements of a single defined strain to ensure that the true biological variability of an organism is reflected in the library.

Unknowns are then compared to the MSP library using a superior pattern-matching approach. This includes peak positions and intensities, ensuring the highest possible levels of accuracy and reproducibility across the complete range of microorganisms.

One system - One workflow

Food Quality

Fast identification of microbial contaminants or spoilage organisms, technological strains and good bacteria during quality control

Accurate quality controls along the fermentation and ripening processes, or during storage, are fundamental to guarantee the stability of starters and the absence of unexpected microbial contaminants. This is crucial to ensure the organoleptic qualities or the probiotic benefits of your fermented products.

Reliable identification of microbial spoilers reveals their heat resistance and growth parameters. This helps in optimizing food formulations, production processes and storage conditions to prevent microbial growth. In addition, a relevant screening plan of raw materials and other ingredients can easily be developed.

Environment & Hygiene monitoring

Fast identification of microbes in food and veterinary processing environments, and efficacy-control of general cleaning and sanitation

Surface sampling and related colony counts help in controlling potential biofilm development. However, identifying the involved bacteria is usually key to establishing appropriate corrective plans.

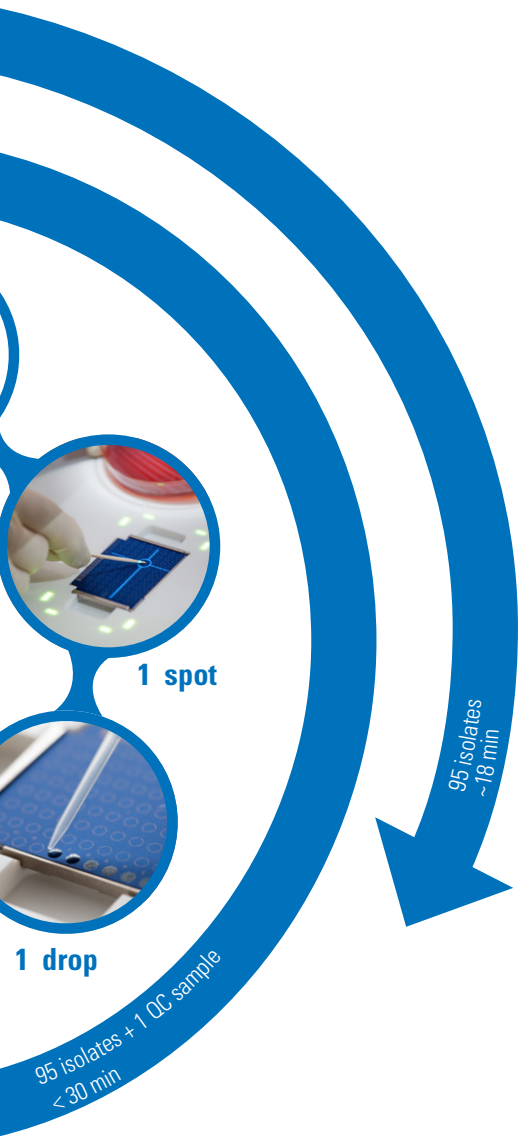
Processing plant personnel or small animals (e.g. rodent pests, or insects) are also potential contamination sources in the food processing facility in many respects.

Environmental swabbing involves the microbiological testing of food preparation surfaces, water tanks, storage facilities, soils and ceilings of breeding facilities, equipment and utensils, using various swab techniques to find out if pathogens are present. It is also used to verify whether a food business' cleaning and sanitation programs are effective (known as cleaning verification).

1 colony • 1 spot • 1 droplet • 1 system for all samples

Gram-positive and gram-negative bacteria, yeasts and molds, can be measured in parallel, in one run; there is no need for various assays or different reaction plates.

Decision-making driven by real-time results



Food Safety

Fast confirmation of pathogens

Using the same workflow and the same consumables, confirmation of *Salmonella* spp., *Cronobacter* spp., *Campylobacter* spp., *Listeria* spp. and *Listeria monocytogenes* can reliably be performed in no time, from various agar plates. The flexible and low cost workflow encourages convenient testing of multiple colonies in one run, gaining crucial time for confirmation.

The AOAC-OMA and ISO 16140-part 6 validation allows confirmation of the above mentioned pathogens and quality indicators from validated culture media. Furthermore, the AOAC-OMA allows identification of bacterial isolates from any of the validated culture media mentioned for isolation of foodborne pathogens and quality indicators.

Confirmation and identification available within minutes

A fast confirmation result allows for timely actions, such as food batch withdrawal or release of safe food batches.

Implementing the system in the laboratory workflow can directly translate to significant cost savings by accelerated testing along the entire process chain.

One system – one workflow

The MALDI Biotyper system can be employed in all of these different application fields with one single easy workflow for bacteria, yeasts and molds, providing rapid and reliable identification of positive microflora and microbial contaminants. The results can then automatically be transferred to the LIMS.

In addition to using the standard MALDI Biotyper Reference Library, the open concept of the system offers the flexibility to build your own reference library with your starter cultures or site-specific contaminants.

AOAC-OMA & ISO 16140-part 6 validated for food microbiology

The AOAC-OMA (Official Method of Analysis by AOAC International) and ISO 16140-part 6 (MicroVal) validation studies have clearly shown the reliability and reproducibility of the MALDI Biotyper.

The MicroVal certificates, issued in 2018 and renewed in 2022, have recently been expanded by the certification body to include now as well the newest MALDI Biotyper sirius systems and the latest MBT Compass HT software version.

The certificates and the reports of the ISO 16140-part 6 validation studies are available on www.microval.org.

The AOAC-OMA #2017.09 and AOAC-OMA #2017.10 protocols are available on www.eoma.aoac.org.

Analyte	Certification Body	Claim	Agars used in evaluation (selective and non-selective)
Cronobacter	MicroVal Certificate N° 2017LR72	Confirmation of *Cronobacter* from various agar plates	TSA, ESIA, CCI
Salmonella	MicroVal Certificate N° 2017LR73	Confirmation of *Salmonella* from various agar plates	TSA, XLD, BGA, RAPID'Salmonella, Brilliance Salmonella, ASAP, CASE Agar
Campylobacter	MicroVal Certificate N° 2017LR74	Confirmation of *Campylobacter* from various agar plates	CBA, mCCDA, RCA, CCA, CampyFood, RAPID'Campylobacter
Listeria* spp. & *Listeria monocytogenes	MicroVal Certificate N° 2017LR75	Confirmation *of Listeria* spp. & *Listeria monocytogenes* from various agar plates	TSYEA, Oxford and modified Oxford, OAA, PALCAM, RAPID'L. mono
Gram-negative organisms	AOAC OMA #2017.09	Confirmation and Identification of *Salmonella* spp., *Cronobacter* spp., *Campylobacter* spp., and other gram-negative organisms	Equivalent to the Microval list
Gram-positive organisms	AOAC OMA #2017.10	Confirmation and Identification of *Listeria monocytogenes* and *Listeria* spp., and other gram-positive organisms	Equivalent to the Microval list

Easy-to-use software

Dedicated to routine testing, easy export to the LIMS

In just a few steps, the simple-to-use software guides users through the set-up of samples for analysis.

The MALDI Biotyper report for food microbiology directly provides the final interpretation of the results: pathogen confirmations and other identifications are clearly listed.

Open microbiology concept

The MALDI Biotyper allows for smooth integration with existing laboratory informatics. The results are converted into a format that can easily be exported to the LIMS.

Report on Confirmation/Identification Results

Result Interpretation Table

	Sample Name	Sample ID	Identification (best match) and confirmation
	A1	BTS (BTS)	Escherichia coli identification
	A2	1 (Standard)	Cronobacter spp. confirmation
	A3	2 (Standard)	L. monocytogenes confirmation
	A4	3 (Standard)	Staphylococcus aureus identification
	A5	4 (Standard)	Campylobacter spp. confirmation
	A6	5 (Standard)	Enterococcus faecalis identification
	A7	6 (Standard)	Salmonella spp. confirmation

After the acquisition of the spectral data has been completed, a report is generated. The result for each sample is clearly listed under „Identification (best match) and confirmation".

Crucial MBT HT Subtyping Module

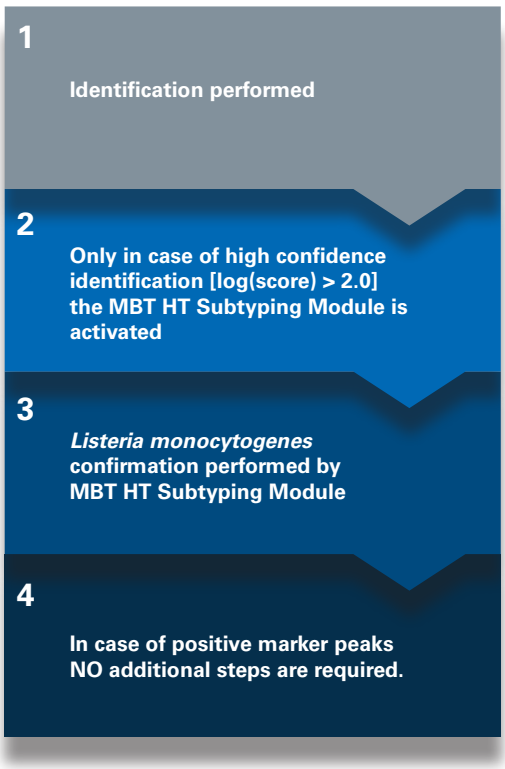
The key to differentiation of closely related *Listeria* species

Differentiation of *Listeria* species is now as easy as can be!
The MBT HT Subtyping Module supports the differentiation of *L. monocytogenes* from the other closely related *Listeria* species and starts automatically when a high identification score is achieved by the MALDI Biotyper.

This enables food microbiology laboratories to implement routine confirmation on *Listeria* spp. and *L. monocytogenes* in the daily workflow, directly from culture without any major effort. Additionally, the identification of other *Listeria* species is provided: *L. grayi, L. innocua, L. ivanovii, L. seeligeri and L. welshimeri*.

Seamless and fast workflow for *Listeria* subtyping

The automated typing process is activated upon high confidence identification of the bacterium in the MALDI Biotyper workflow. Subsequently, the MBT HT Subtyping Module looks for decisive peaks for species differentiation in the mass spectrum. Confirmation of *Listeria monocytogenes* is only successful when certain marker peaks are found.
To acquire a typing result, no additional sample preparation is required once the samples are transferred to MALDI target plates.



Enjoy smart and stress-free operation

A platform suited to your needs

Bruker offers laboratories the opportunity to choose the MALDI-TOF mass spectrometer that best fits their needs:

- The MALDI Biotyper sirius GP System with Bruker's proprietary lifetime* smartbeam™ solid state laser technology at 200 Hz repetition rate, and positive as well as negative ion mode. The additional capability of analysis in negative ion mode broadens the research applications, such as the analysis of lipids for e.g., resistance detection.
- The MALDI Biotyper sirius one GP System, with the same innovative improvements, smartbeam™ 200 Hz laser and positive ion detection only.

Analysis of up to 600 samples/hr - Even shorter Time-to-Result

With Smart Spectra Acquisition™, data generation is accelerated by minimizing the number of laser shots per sample needed to acquire a meaningful spectrum. An additional benefit of this function is the optimal exploitation of the laser lifetime. System improvements, including the newest low-power electronics and a high-performance vacuum system, generate fast target exchange times for accelerated Time-to-Result - even faster than before.

The Time-to-Result is further shortened dramatically by the power of the new MBT Compass HT software, resulting in identification results popping up simultaneously with spectra acquisition, one by one, without delay.

An entirely filled MBT Biotarget 96, holding 95 isolates and 1 QC sample, results in a complete identification report in ~5 minutes. This analysis speed, combined with a superior fast target exchange, allows analysis of up to 600 samples/hour.

Resolution optimized for reliable profile matching

Overall, the resolution is an important performance parameter in MALDI-TOF mass spectrometry. A high resolution is desired for more precise analysis of samples, as it refers to the ability to distinguish between two closely spaced peaks in a mass spectrum. Thanks to Bruker's patented PAN™ resolution, the compact MALDI Biotyper achieves an optimal resolution over the relevant mass range of the mass spectral profile acquired from the unknown microorganisms. This accuracy is crucial when it comes to profile matching with thousands of reference spectra, for reliable identification of microorganisms.

Optimal performance secured by zero-button IDealTune™

Experience peak performance without the hassle - thanks to automated tuning!

- No extra tuning samples
- No extra time
- No extra costs
- Focus on results!

The new zero-button IDealTune feature on our MALDI Biotyper sirius systems automatically finetunes the key parameters of the MALDI-TOF system, ensuring stable data quality. Without any user intervention, IDealTune is performed systematically in the background while analyzing the Bacterial Test Standard, which is anyway part of a sample run.
The quick and simple Bacterial Test Standard quality check, performed before each run, ensures the highest standard of run-to-run reproducibility.
Forget about tedious preparation of dedicated tuning samples, forget about time-consuming manual tuning, forget about extra costs.
Relax knowing that machine-driven tuning is in place, and focus on results!

Continuous operation

The integrated ion source cleaning permits continuous high performance with minimized maintenance requirements. Cleaning the source using the separate IR-laser is performed easily by a few clicks in the software, without breaking vacuum.

The best technology from the experts in mass spectrometry

Bruker, a renowned leader in MALDI-TOF technology, recognizes the significance of designing robust, high-performance platforms that cater to extensive and routine usage in microbiology laboratories. Through continuous hardware development, we proudly present the fourth-generation of Bruker's benchtop MALDI Biotyper systems that set new benchmarks in this field.

Our latest systems incorporate state-of-the-art low-power electronics and a high-performance vacuum system, resulting in rapid target exchange times for even faster Time-to-Result than ever before. These system improvements guarantee swift and precise identification of microorganisms, ensuring greater efficiency in your laboratory processes. At Bruker, we are committed to providing you with cutting-edge MALDI-TOF technology that empowers you to excel in your microbiology laboratory.

	MALDI Biotyper sirius GP System
Speed of analysis	▪ 95 isolates + 1 QC sample ~ 5 min to identification ▪ Identification of 600 samples/hr ▪ Identification results popping up simultaneously with spectra acquisition, one by one, without delay
Laser	Bruker's proprietary lifetime* smartbeam laser ▪ 200 Hz repetition rate ▪ At least 500 million laser shots are guaranteed
Polarity	Positive and negative ion mode
Mass range	Full functionality of a linear MALDI-TOF, with MALDI Biotyper applications focused to: ▪ 0-1.000 Da (resistance detection) ▪ 2.000-20.000 Da (microorganism identification)
Vacuum system	Oil-free membrane pre-vacuum pump and high capacity turbomolecular pump ▪ high pumping capacity, which in combination with a clever source design results in very fast target exchange ▪ minimal downtime after maintenance
Other features	LED strip to remotely observe system status Perpetual Ion Source™ with IR-laser self-cleaning functionality Whispermode™ <60 dB under normal operating conditions Patented PAN™ technology for high mass resolution over a wide mass range Latest low-power electronics protecting natural resources Voltage: 220 V / 110 V
Dimensions & Operating Parameters	L x W x H: 500 x 710 x 1070 mm / 19.7 x 28.0 x 42.2" Net weight: 75 kg / 165.4 lb Noise: < 60 dB Temp Range: 16 - 30°C / 61 - 86°F Operating Humidity: 20 - 75%, non-condensing

The MALDI Biotyper sirius one GP System comes with the same features but hosts only positive ion mode.

* Lifetime means: 500 million laser shots or seven years (whichever occurs first)

MALDI Biotyper System overview

Benchtop MALDI-TOF system

- **MALDI Biotyper sirius GP System***,
  with 200 Hz smartbeam™ laser and positive as well as negative ion detection

Routine identification of gram +/- bacteria, yeasts

Software
- MBT Compass HT software
- MBT Compass Library
- MBT HT Subtyping Module
- Security Related Library for identification of highly pathogenic microorganisms (optional)

Consumables
- Matrix HCCA-portioned
- Bacterial Test Standard
- MBT Biotarget 96

Filamentous fungi and Mycobacteria identification (optional)

Software
- MBT HT Filamentous Fungi Module
- MBT HT Mycobacteria Module

Consumables
- MBT Mycobacteria Kit

Certification/Validation

- Recognized as an Official Method of Analysis by AOAC International
- ISO 16140-part 6 validated by MicroVal

Accessories for workflow optimization & automation (optional)

- MBT Shuttle ergonomic target holder
- MBT FAST™ Shuttle for standardized and accelerated drying of matrix and other liquids
- MBT Pilot® for guided sample transfer

THE ORIGINAL

Often imitated, never duplicated

* As an alternative, also the MALDI Biotyper sirius one GP System can be used.

Please contact your local Bruker sales representative for availability of the optional MBT system components in your country.

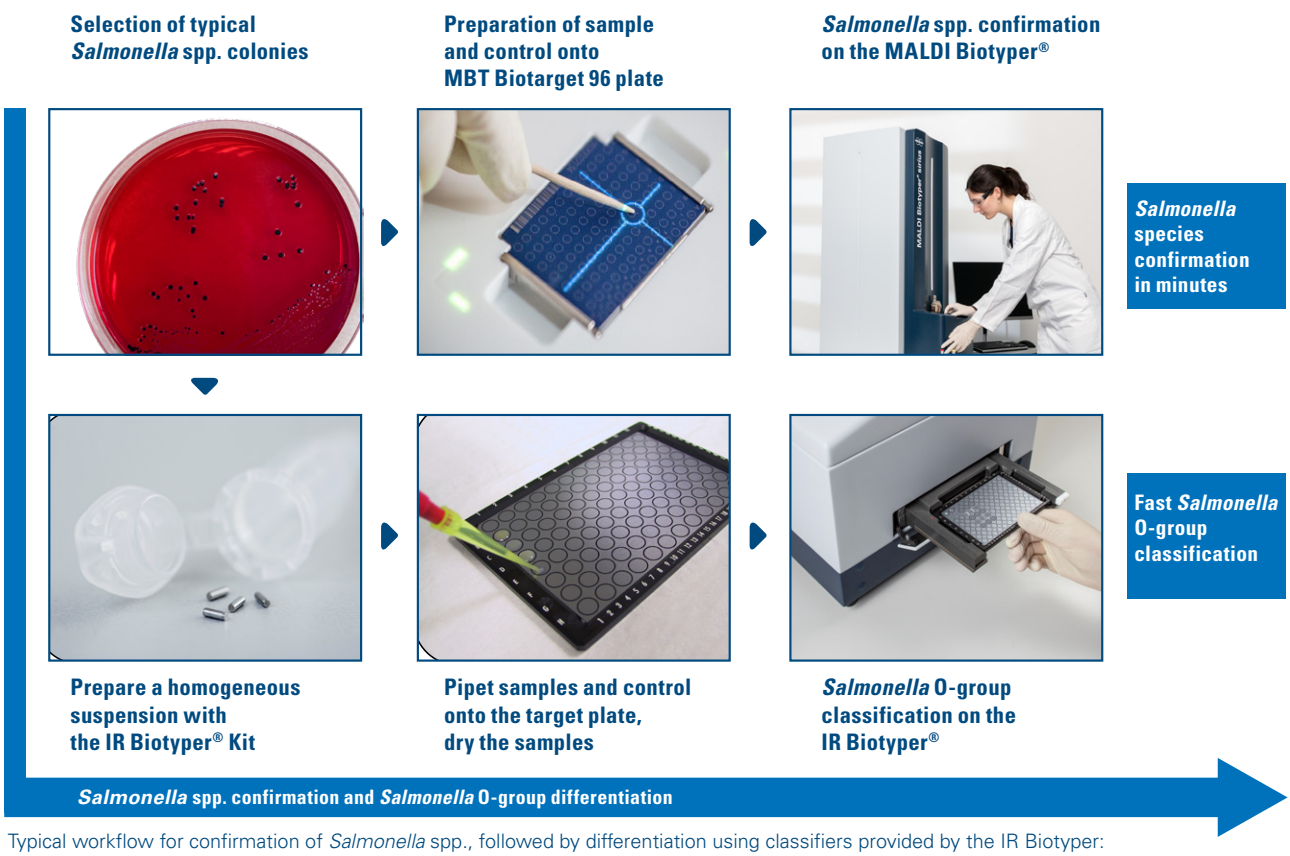
Enabling smarter food microbiology

Also in need for a rapid strain discrimination method and cluster analysis, for real-time quality control and source tracking?

Bruker's IR Biotyper® system allows same-day strain typing of colonies, based on FT-IR spectroscopy. The easy-to-use benchtop system enables fast and cost-effective microbial typing with high discriminatory power. With the IR Biotyper, fingerprinting and data analysis are performed in less than 3 hours, allowing real-time monitoring of technological processes and source tracking.
Needing only 30 minutes for the sample preparation of a maximum of 30 isolates, Bruker's typing solution is easy to implement in a routine laboratory workflow.

Software connectivity with the MALDI Biotyper enables easy upload of sample data from MALDI Biotyper to IR Biotyper.

Summarized, only some benchtop space equipped with the dedicated MALDI Biotyper solution for food microbiology, complemented by the IR Biotyper, is needed for confirmation/identification and strain typing of microorganisms, in just 3 hours.



Typical workflow for confirmation of *Salmonella* spp., followed by differentiation using classifiers provided by the IR Biotyper: Starting from colony material and using both instruments in parallel or sequential, *Salmonella* spp. confirmation and differentiation of O-serogroups can be achieved very fast, starting from colony material.

MBT consumables for basic identification

Bacterial Test Standard (BTS)

The BTS is an *E. coli* extract spiked with two high molecular weight proteins and has been developed for the quality control process of the MALDI Biotyper System. Its specific composition covers the entire mass range of proteins used for precise identification of microorganisms. Mandatory for maintaining optimal performance of the MALDI Biotyper with IDealTune.

Content: One box consisting of 5 tubes providing 50 µL per tube / Part No. 8255343

HCCA Matrix, portioned

The instant HCCA matrix enables easy and convenient preparation of HCCA matrix solutions. The matrix is soluble in standard organic solvent, easy to handle, and enables highly sensitive measurements.

Content: One box consisting of 10 tubes providing 250 µL per tube / Part No. 8255344

Disposable MBT Biotargets

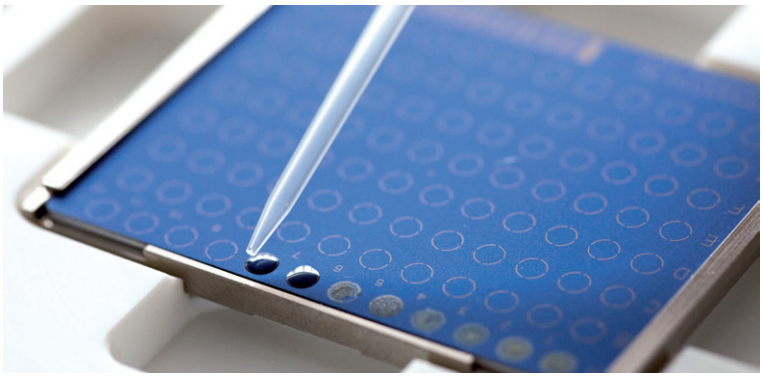
The ready-to-use disposable MBT Biotargets offer 96 positions and a unique barcode for full traceability in paperless workflows.

MBT Biotarget 96

Set of 20 individually barcoded MALDI Biotyper target plates, 96 positions each / Part No. 1840375

MSP adapter for MBT Biotarget 96

Adapter required to use MBT Biotargets with MALDI Biotyper Systems / Part No. 8267615

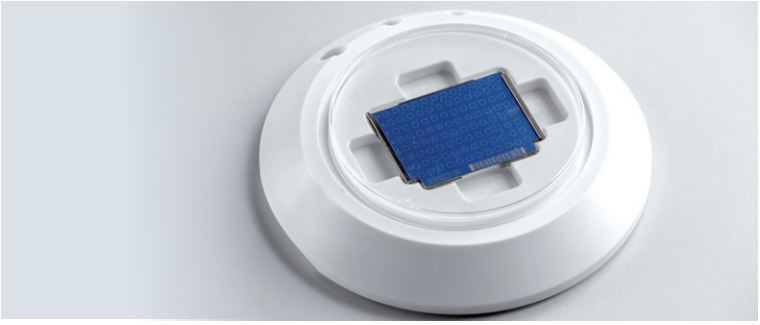


MBT workflow accessories

MBT Shuttle Target Holder

The MBT Shuttle target holder is used to securely hold MBT Biotargets during the sample preparation process. The secure grip, non-slip rubber feet and ergonomic shape make sample preparation easier.

One target holder / Part No. 1847032



MBT FAST™ Shuttle

Standardized and accelerated drying of MALDI Biotyper matrix and other liquid reagents

Part No. 1872847

MBT Pilot®

The MBT Pilot facilitates correct sample positioning through patented microprojection technology by indicating the next free MALDI target plate position.

Part No. 1822041

Not for use in clinical diagnostic procedures.
Please contact your local representative for availability in your country.

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