C297-E062F

SHIMADZU
Excellence in Science

MCE-202 Microchip Electrophoresis System for DNA/RNA Analysis

MultiNA

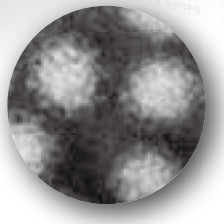
Simplifies Gel Electrophoresis
Quick Setup, Great Results

MCE-202 Microchip Electrophoresis System for DNA/RNA Analysis

MultiNA

RNA Analysis
for Genetic Research

Genotyping



Infectious Disease
Analysis

Start Analysis in Just Three Steps ▶ Page 4

Extremely simple operation. Once the analysis schedule has been created, simply load the samples and reagents and click the Start button.

Automated Analysis From 1 to 108 Loaded Samples ▶ Page 6

Fast analysis with up to four microchips in parallel.

Wide Range of Applications ▶ Page 8

Widely used for genetic research applications as well as food analysis, genotyping, microbiological analysis, infectious disease analysis, and RNA analysis.

Start Analysis in Just Three Steps

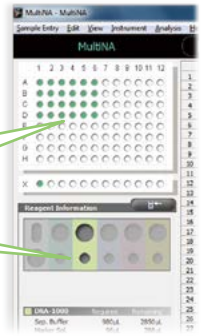
Extremely simple operation. Once the analysis schedule has been created, simply load the samples and reagents and click the Start button.

Outstanding Ease of Use

Step 1

Register the analysis schedule.*

* A single analysis schedule permits analysis using multiple reagent kits.

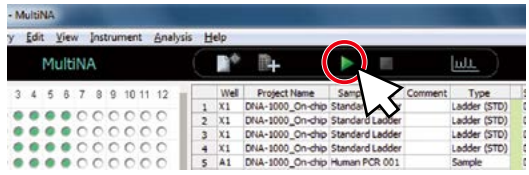


Step 2

Load the samples and reagents.

Step 3

Press the Start button.



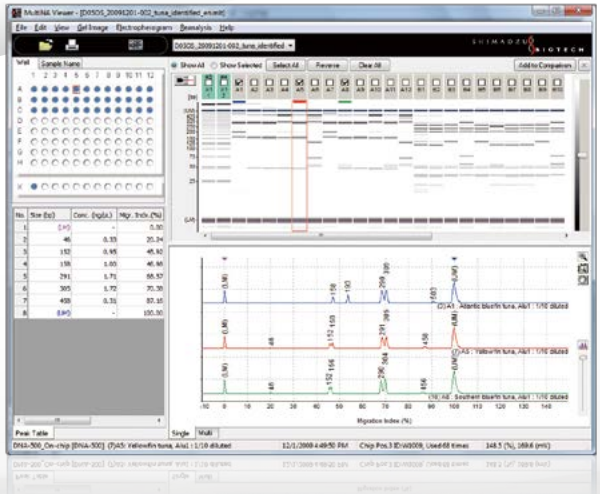
Automated Analysis

Sample Application → Migration → Separation → Detection → Washing → Analysis

Full automation of all steps from sample application to data analysis.

Result

Analysis results screen is displayed.



Solution to Your Frustration with Agarose Gel Electrophoresis

Agarose Gel Electrophoresis

MultiNA

Ease of operation

Requires a number of different manual steps

- The sequence of manual operations from gel creation to visualization takes much time and effort.
- It would be preferable to collect data over lunch hour and overnight.
- As there are many steps you are tired up with the process.

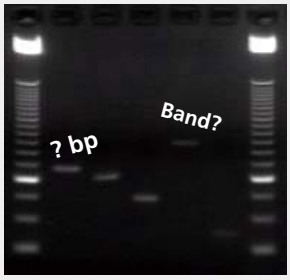
Easy automated analysis

- **No need to cast gels.**
- **Just load your samples and reagents for automated analysis.**
- **Automated cleaning after analysis.**

Quality of Results

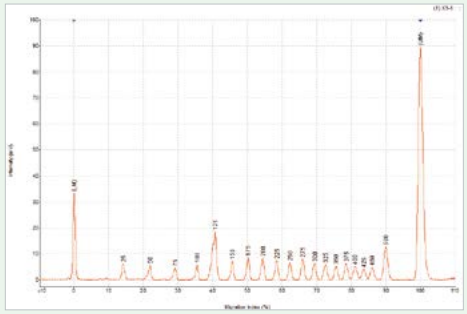
Data quality could be better

- Only approximate sizes can be recognized when comparing to a ladder pattern.
- Discrepancies from analysis to analysis make comparisons difficult.
- Inadequate separation.
- Difficult to detect small DNA.



Objective analysis of results

- **Correction by internal standard markers and ladder standards result in the output of highly reproducible size data.**
- **High-sensitivity fluorescent dyes achieve order-of-magnitude greater sensitivity than agarose/ethidium bromide systems.**
- **Good separation and clear detection of DNA below 100 bp.**



Management

Organisation of results is difficult

- Data (photograph) organization is tedious.
- Hand-written records lead to loss and mistakes.

Convenient data management

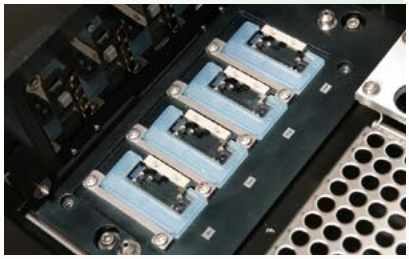
- **Gel images and waveform data saved as image files.**
- **Viewer allows parallel display of analysis data from different times and dates.**
- **Numerical data can be output as a csv file for analysis by Shimadzu AutoFinder (option).**

▶ Page10

Automated Analysis of Up to 108 Loaded Samples

Reusable microchips and selecting the optimal reagent for each sample achieves excellent analytical performance.

* The 96-well PCR plate can be covered with an aluminum sheet to prevent sample evaporation.



Chip stage

System for Automated Analysis

Reagents

Five different reagent kits are available to suit different samples. To make operation visually simple, the reagent holders and software screen display are color-coded to match the reagent kit used.

Reagents

Reagent holder

Sample stand and ladder

Instrument

Automated Analysis

Permits automated analysis using parallel processing of up to four microchips. Data for each sample can be observed after each analysis is complete, with no need to wait for all sample analyses to complete.

Automated Cleaning Function

Microchips are rinsed with water after analysis is complete. Automated cleaning can be performed using the optional RA Chip Cleaning Kit according to the microchip condition.

Microchips

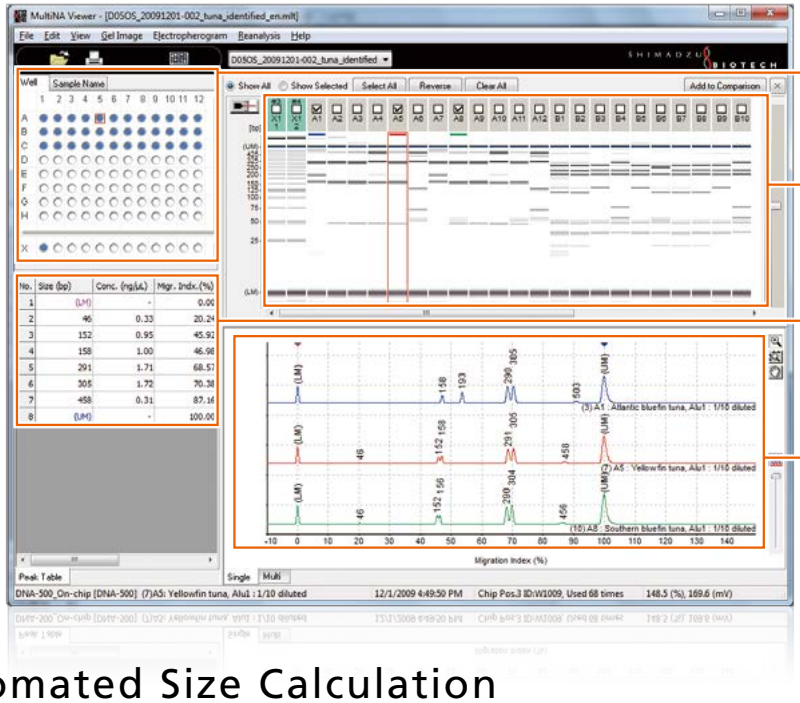
Extremely fine flow channels and electrode patterns are created in a quartz substrate using MEMS* technology. A special coating allows the microchips to be reused.

* MEMS (Micro Electro Mechanical Systems)

Displaying Analysis Results in the MultiNA Viewer

Analysis results are obtained as electronic data that can be observed using the MultiNA Viewer software.

The comparative view function allows data from analyses performed at different times to be compared and analyzed on the same screen.



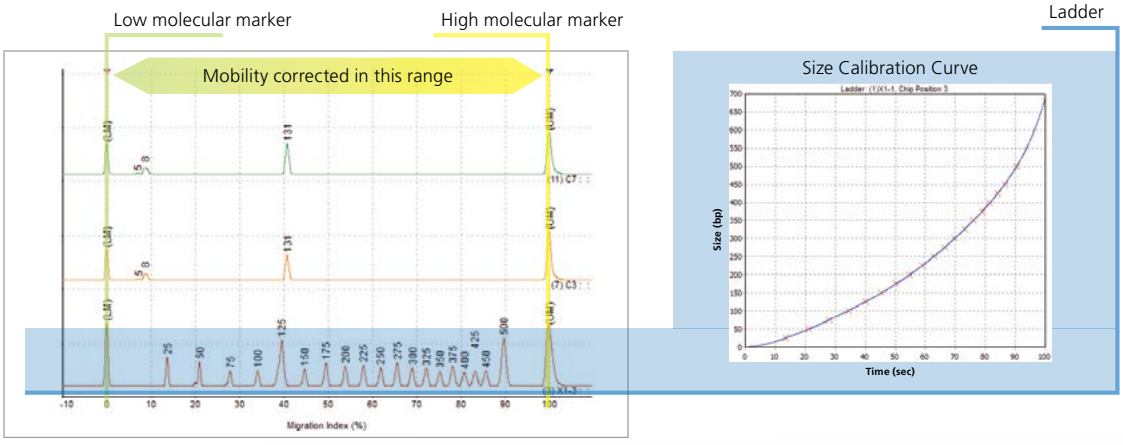
Sample Well Display
Displays the analysis progress status in different colors.

Gel Image
Can be saved as image data (jpg, bmp, tif).

Peak Table
Predicted size values and concentrations can be saved to a csv file.

Electropherogram
Can be saved as image data (jpg, bmp, tif).

Automated Size Calculation



Each reagent kit contains internal standard markers. By mixing the markers with the analysis target (sample and ladder*1) before performing analysis, the mobility of the ladder and sample can be corrected. The software automatically handles mobility correction utilizing markers, the size calibration curve from the ladder peaks, and sample size prediction. The software also allows the registration and setup of your own ladders as well as the commercially available ladders*2.

(*1 A ladder is equivalent to markers used in agarose gel electrophoresis. *2 Conditions, such as size and concentration, determine which ladder should be used.)

Wide Range of Applications

Widely used for genetic research as well as food analysis, genotyping, microbiological analysis, infectious disease analysis, and RNA analysis.

Application to Food Analysis Detection of Allergenic Substances

Application News: No. B23

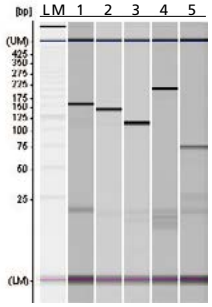
Japan was the world's earliest adopter of a labeling system for foods containing allergens. DNA analysis by qualitative PCR can be performed on five (wheat, buckwheat, peanuts, prawn, and crab) of the seven specified raw materials (excluding egg and milk).

Sample
DNA extraction
Ion-exchange resin kit

DNA Purification
PCR
Primer specific for each sample

PCR Products
Analysis of PCR products
MCE-202 MultiNA

Detection of Allergenic Substance



Gel Images

LM : Ladder Marker (25bp DNA Ladder)
Lane 1 : Wheat
Lane 2 : Buckwheat
Lane 3 : Peanuts
Lane 4 : Prawn
Lane 5 : Crab

Application to Genotyping Identification of Thunnus Using PCR–RFLP Method

Application News: No. B28

The tuna-specific genetic sequence in mitochondrial DNA is amplified using PCR. This amplified DNA is cleaved with a restriction enzyme and the pattern used to identify the tuna species.
* PCR–RFLP: (Polymerase Chain Reaction–Restriction Fragment Polymorphism)

Sample
DNA extraction

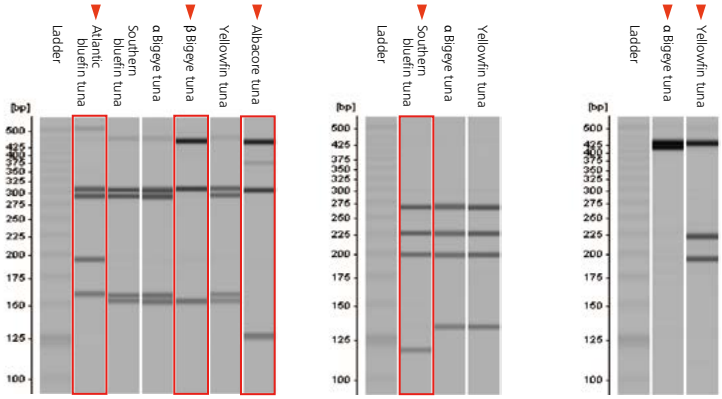
DNA Purification
PCR

PCR Products
Restriction enzyme processing

PCR-RFLP Products
MultiNA electrophoresis

Identification of Tuna Varieties

• Tuna Species Identification Manual (Food and Agricultural Materials Inspection Center; Fisheries Research Agency, Japan)



Gel Images of PCR–RFLP Separation Patterns

Application to Multiplex-PCR Identification of Rice Varieties

Application News: No. B30

Multiplex-PCR is performed on four sets of samples using a variety identification kit (from Kokken). The rice variety can then be identified by comparing the pattern obtained against patterns for each rice variety.

Sample
DNA extraction

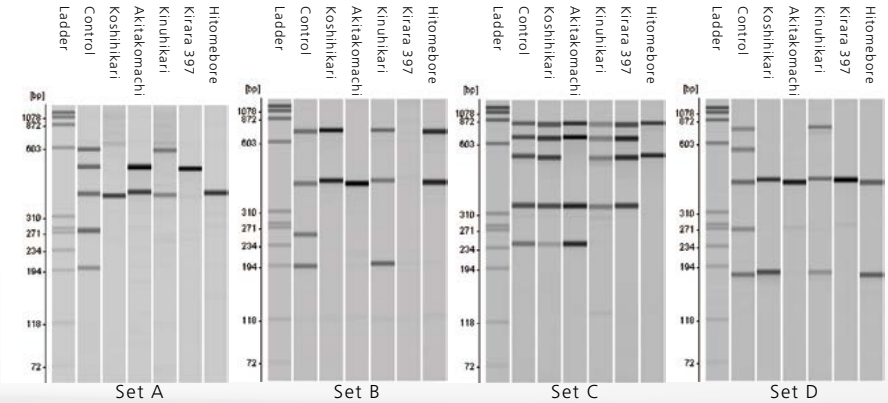
Extracted DNA
Multiplex PCR by Variety Identification Kit

PCR Products
Analysis of PCR products-MultiNA

Acquisition of appearance patterns of PCR products

Collation of patterns

Identification of Rice Varieties

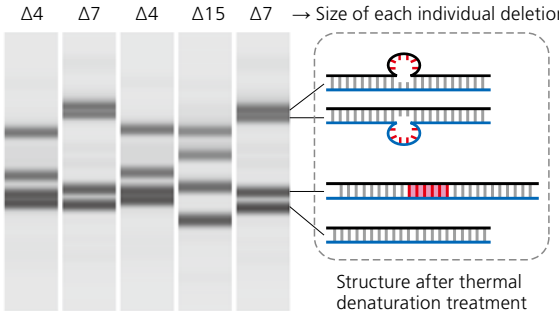


Applications to Genome Editing Detection of Deletion Mutations Induced by Genome Editing Tools

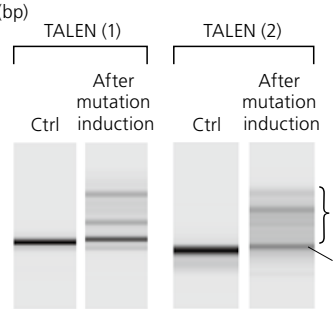
Application Notes: No. 36

Mutations are induced by the CRISPR/Cas9 and TALEN genome editing tools. PCR is performed with respect to the regions adjacent to the induced deletion mutations. Thermal denaturation and annealing are implemented on the PCR products obtained, thereby adjusting the heteroduplex. Because of the difference in mobility, the heteroduplex can be separated and detected, enabling confirmation of minute deletion mutations and the activity of the planned genome editing tool.

Sample
PCR
PCR products
Thermal denaturation and annealing
Heteroduplex
Electrophoresis MultiNA
Detection of deletion mutations



Detection of Deletion Mutations (Hetero) After the F1 Generation



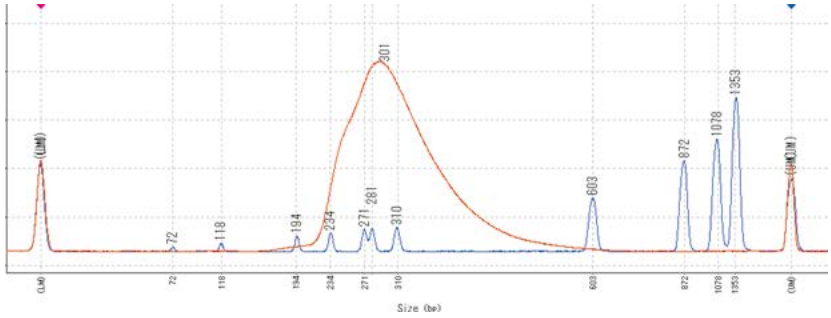
In Vivo Evaluation of the Activity of a Genome Editing Tool with Respect to the F0 Generation (Mosaic)

Applications to NGS NGS Library Quality Control

Application News: No. B52

A library prepared utilizing the NGS Library Preparation Kit was analyzed, and a postrun was performed with smear analysis software. The quality of the NGS library was confirmed from the analysis results including average size and concentration.
* NGS: Next Generation Sequencer

Sample
Pretreatment with the preparation kit
NGS library
Library analysis MutiNA
Postrun (Smear analysis)
Confirmation of the quality of the library



Example of an NGS Library Analysis (Left) Gel Image (Right) Electropherogram

Red: NGS Library (Smear Samples)
Blue: ΦX174 DNA/*Hae* III Markers for the Size Calibration Curve

Application to RAPD-STS Method Identification of Common Bean Cultivars by RAPD-STS

Application News: No. B32

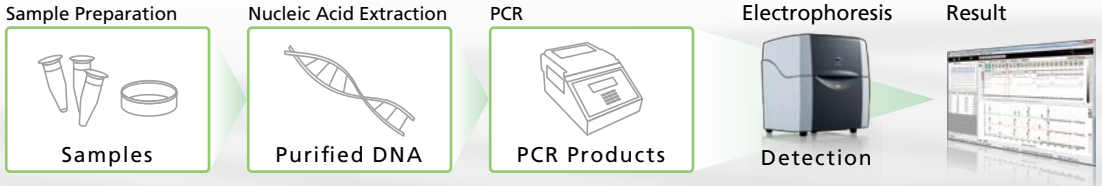
PCR is performed on DNA extracted from four types of white kidney bean. The white kidney bean variety can then be identified by comparing the pattern obtained against patterns for each variety.
* RAPD-STS: (Random Amplified Polymorphic DNA-Sequence Tagged Sites)

Example of RNA Analysis Rat Total RNA Analysis

Application News: No. 6

During research using RNA, it is important to continuously monitor the RNA quality to ensure that the RNA used is not affected by degradation by RNase. MultiNA is able to accurately recognize 18S-rRNA and 28S-rRNA based on the calibration curve information acquired from the ladder.

Application Example



MultiNA
Microchip Electrophoresis System for DNA/RNA Analysis

Dedicated Consumables

MultiNA Reagent Kits

Reagent kits are designed to work optimally for different size ranges and sample types.

P/N: 292-27910-91 DNA-500 Kit (1000 analyses)
P/N: 292-27911-91 DNA-1000 Kit (1000 analyses)
P/N: 292-27912-91 DNA-2500 Kit (1000 analyses)
P/N: 292-36600-91 DNA-12000 Kit (1000 analyses)
P/N: 292-27913-91 RNA Kit (1000 analyses)

Reagent Kit Contents

(1) Separation buffer
(2) Marker solution (internal standard marker)

* The kits do not contain fluorescent dyes or ladders. (No ethidium bromide used.)
* The kits have a shelf life. Please use them immediately after opening.

Microchip

P/N: 292-36010-41
Part Name: MICROCHIP, TYPE WE-C
The microchip is common to all reagent kits.

RA Chip Cleaning Kit

P/N: 292-35925-91
Part Name: CHIP CLEANING KIT-RA
Fluorescent dye and reagent components can be adsorbed onto the wall of the microchip flow channel, thus reducing the separation performance and lowering the number of reuses. Cleaning of the microchip using the CHIP CLEANING KIT-RA eliminates the adsorbed components and improves (or restores) the separation performance of the microchip.

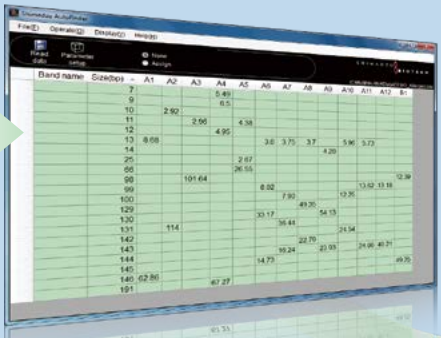
Options —Detection of Specific Size DNA

Shimadzu AutoFinder Optional Software for Detection of Specific Size DNA

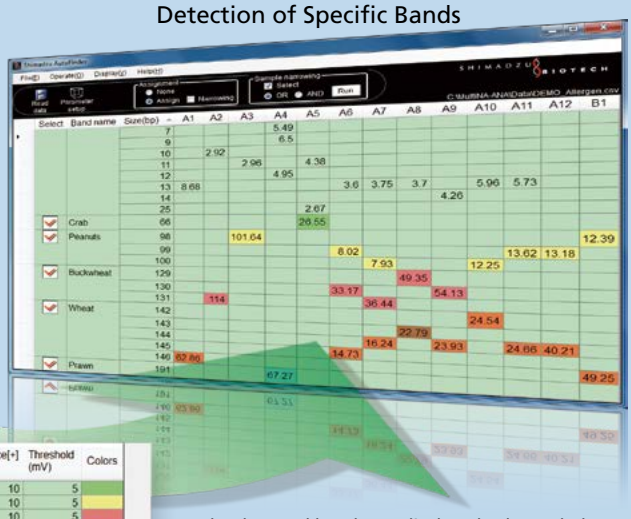
P/N: 292-96800-01 Shimadzu AutoFinder
Shimadzu AutoFinder directly imports the MultiNA analysis results in a csv format to detect DNA of specific sizes. It enables the simple and rapid analysis of data accumulated through large numbers of analyses in the course of daily routine work. Normally complex manipulation of data required to evaluate the absence or presence of target bands and the detection of specific size DNA. The Shimadzu AutoFinder is a powerful tool to support your analysis.
• Developed and manufactured by Shimadzu System Development Corporation.

MultiNA Data Import Screen

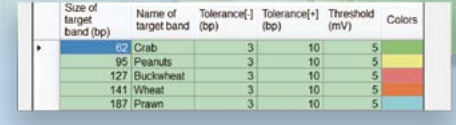
Import MultiNA analysis results.



Detection of Specific Bands



• The detected bands are displayed color-coded.



Size of target band (bp)	Name of target band	Tolerance[-] (bp)	Tolerance[+] (bp)	Threshold (mV)	Colors
62	Crab	3	10	5	
95	Peanuts	3	10	5	
127	Buckwheat	3	10	5	
141	Wheat	3	10	5	
187	Prawn	3	10	5	

Detection Parameter Setting Screen

• Select the error range and detection sensitivity.
• Select the color for bands to be detected.

Specifications

Sample rack	Compatible with 96-well PCR plate† and 12/8-strip PCR tube (Shimadzu recommended product)
Microchip	Quartz, 23 mm separation channel length, on-chip electrodes (insert up to four microchips)
Pretreatment	Automatic sample injection, automatic separation buffer replenishing, automatic chip cleaning
Electrophoresis Voltage	Max. rated voltage: 1.5 kV, max. current: 250 µA
Analysis Cycle time	Approx. 80 s (using four chips) * DNA standard analysis (DNA-1000/premixed). This does not include time required for carrying out the first and final wash and initial analysis.
Detection Method	LED-excited fluorescence detector (470 nm excitation wavelength) * Class 1 LED product
Separation Size Range	25 to 500 bp (DNA-500 Kit) 100 to 1000 bp (DNA-1000 Kit) 100 to 2500 bp (DNA-2500 Kit) 100 to 12000 bp (DNA-12000 Kit) Up to 28S rRNA (5.0 knt) (RNA Kit)
Resolution	5 bp (25 to100 bp), 5% (100 to 500 bp), 10% (500 to 1000 bp), 20% (1000 to 12000 bp)
Sizing Accuracy	±5 bp (25 to 100 bp), ±5% (100 to 500 bp), ±15% (DNA-1000, DNA-2500, DNA-12000)
Required Sample Volume	DNA analysis: Premix mode: 2 to 10 µL (after mixing with marker solution: 6 to 30 µL) On-Chip Mixing mode: 5 to 30 µL RNA analysis: Premix mode: 3 to 15 µL (after mixing with marker solution: 6 to 30 µL) In the Premix mode, the marker solution is mixed with the sample before loading in the instrument. In the On-Chip Mixing mode, the sample and marker solution are loaded separately and mixed on the microchip under program control.
Maximum Salt Concentration	DNA analysis: 10mM Tris-HCl containing 125 mM KCl or NaCl max. RNA analysis: 10mM Tris-HCl, containing 1 mM EDTA max.
Min. Detection Limit	DNA analysis: 0.2 ng/µL (at 10mM Tris-HCl buffer, containing 50 mM KCl and 1.5 mM $MgCl_2$) RNA analysis: 5 ng/µL (total RNA), 25 ng/µL (mRNA) (at 10 mM Tris-HCl buffer, containing 1mM EDTA)
Quantitation Range	DNA analysis: 0.5 to 50 ng/µL (at 10mM Tris-HCl, containing 50 mM KCl and 1.5 mM $MgCl_2$) RNA analysis: 25 to 500 ng/µL (total RNA), 25 to 250 ng/µL (mRNA) (10 mM Tris-HCl buffer, containing 1 mM EDTA)
Quantitation Accuracy	DNA analysis: ±30% (at 10 mM Tris-HCl buffer, containing 50 mM KCL) (DNA-500, DNA-1000, and DNA-2500 Kits) ±40 % (DNA-12000 kit. Quantitative accuracy is based on verification from 200 bp to 12000 bp.)
Quantitation Repeatability	RNA analysis: CV 10% or less (CV 20% or less for eukaryotic-origin total RNA at concentrations of 150 ng/µL or more)
External Dimensions	W 415 mm × D 545 mm × H 508 mm
Weight	43 kg
Power Supply	100 to 120 V, 220 to 240 (CE Marking) 300 VA max.

Note) The analysis performance specifications above are based on Shimadzu standard analysis conditions and standard samples.
Note) The specifications might not be satisfied depending on the analysis sample and the analysis conditions.
Note) Reagent kits and microchips are not included as part of the MultiNA instrument's standard accessories.
† An aluminum sheet (Shimadzu recommended product) can be applied to prevent sample evaporation.

■ Controller and Viewer Software

Controller	Creating analysis schedules, real-time control, automatic analysis pretreatment, automatic analysis post-treatment, automatic error processing, analysis log management, analysis performance checks
Data Processing	Batch display/detailed display of gel images/pherograms, automatic quantitation and size prediction by size markers, data searching, data import/export, manual editing and re-analysis Changes in average size and concentration with respect to smear samples (during smear analysis)
Reports	Multilevel data display, tree display of samples/files, RNA structural comparison, analysis performance check results, analysis log

Note) Control PC is not supplied with the instrument. Purchase the control PC separately.
Even if the PC model meets the conditions above, the software operation cannot be guaranteed due to the effects of Windows settings and the hardware configuration.
The display language (English or Japanese) can be selected when the software is installed.

MCE®-202 MultiNA is not available in the United States.

Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Shimadzu Corporation

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