SHIMADZU
Excellence in Science

Tm Analysis System

Tm Analysis System

Tm analysis systems can accelerate the development process and improve the quality of oligonucleotide therapeutics. Control by LabSolutions™ software enables compliance with ER/ES-related regulatory requirements and improves the efficiency of analyzing the thermal stability (Tm analysis) of nucleic acids.

Reliability

Reliable Data Integrity

The Tm analysis system in conjunction with LabSolutions DB/CS can achieve the highest data integrity levels in the industry. Measurement parameters, audit trails, and results of data acquisition and analysis are managed in a database protected with user privilege settings and security policies to prevent unintended operations or data tampering by operators.

Versatility

Functionality for Satisfying Various Needs

In addition to trace measurement and high-sensitivity measurement capabilities required for Tm analysis, the system also satisfies a variety of other needs, including thermodynamic parameter analysis using functionality for automatically transferring data to an Excel® file.

Efficiency

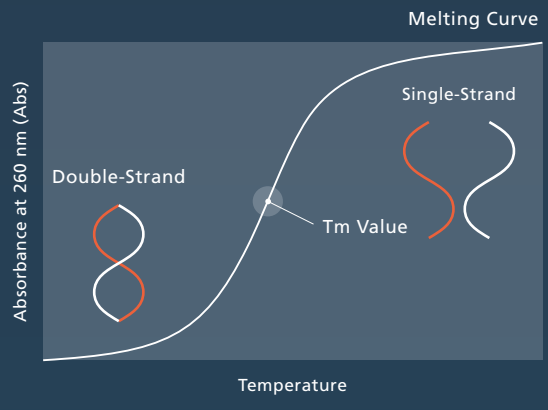
Efficient Automated Workflow

Tm analysis system dramatically decreases the time and trouble required for Tm analysis by automating all steps (particularly the time-consuming annealing and analysis steps).

Note: The photo on the right shows the UV-2600i ultraviolet-visible spectrophotometer with a TMSPC™-8i 8-cell thermoelectrically temperature-controlled cell holder connected. However, the TMSPC-8i can be also connected to either UV-1900i or UV-2700i models.

Tm Analysis

Tm analysis serves an important role in checking the thermal stability and sequence of nucleic acids. In Tm analysis, heat is applied to the nucleic acids in double-strands. Then, the change in absorbance (melting curve) that occurs as the temperature increases and the strands dissociate into single strands is measured. The melting temperature (Tm value) is determined as the temperature where the mole fractions of single and double strands are equal.



Reliability

Reliable Data Integrity

System Configuration

Tm analysis system consists of the following.

- UV-Vis Spectrophotometer
- TMSPC-8i 8-cell thermoelectrically temperature controlled cell holder
- LabSolutions UV-Vis Tm software

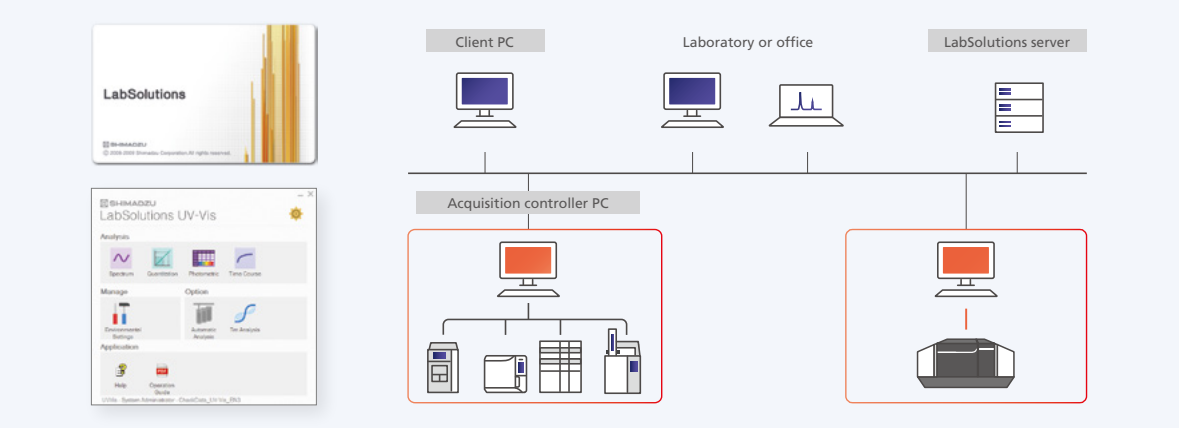
NEW TMSPC™-8i

UV-Vis

NEW LabSolutions™ UV-Vis Tm

Data Integrity

Tm analysis systems comprise a spectrophotometer, TMSPC-8i 8-cell thermoelectrically temperature-controlled cell holder, and LabSolutions UV-Vis Tm software. They can automatically determine Tm values based on melting curve measurements using the average method or derivative method. LabSolutions UV-Vis Tm can provide the industry' s highest data integrity levels when linked to a LabSolutions DB/CS system, which has an extensive track record from use with LC, GC, and many other analytical instruments.



Note: LabSolutions DB UV-Vis: This is a stand-alone database management system which analysis software on a single PC.
LabSolutions CS system: A server, client, and acquisition controller are connected on the network. The data of all devices are centrally managed by the database built on the server. User and permission management is centrally managed with this system.

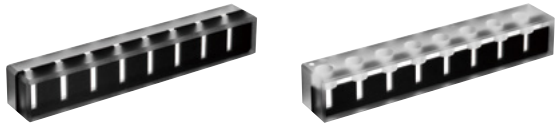
Versatility

Functionality for Satisfying Various Needs

8-Cell Micro Multi-Cell

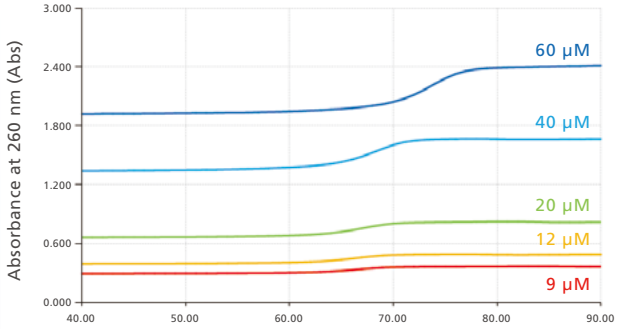
This micro multi-cell can be used to measure eight samples at the same time using the same measurement conditions.
In addition to previous micro multi-cell models with a 10 mm optical path length (with a 100 µL minimum sample volume) for satisfying high-sensitivity measurement needs, a new model with a 1 mm optical path length (with a 10 µL minimum sample volume) for measuring micro-quantities of expensive samples has been added to the lineup. Cells with a 1 mm optical path length can result in sample evaporation problems, but a new sealing method*, which suppresses the evaporation of samples by sealing the top side of the cell, enables reliable measurement of samples with high melting temperatures.

*The sealing method was supported by Professor Junji Kawakami (Department of Nanobiochemistry, Faculty of Frontiers of Innovative Research in Science and Technology (FIRST), Konan University, Japan). This was supported by AMED under Grant Number JP21ae0121022, JP21ae0121023, JP21ae0121024 (Project leader: Satoshi Obika).



NEW 1 mm Optical Path Length Micro Multi-Cell

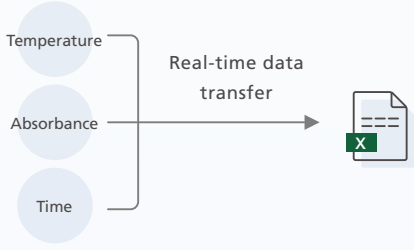
10 mm Optical Path Length Micro Multi-Cell

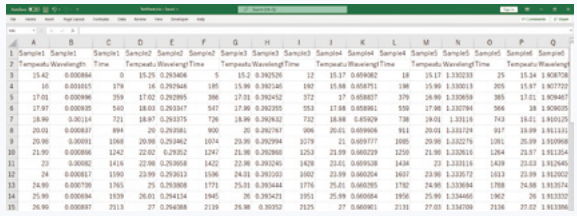


Melting Curve of Nucleic Acid (M13 Primer)
(Using Micro Multi-Cell with 1 mm Optical Path Length)

Real-Time Transfer Function and Thermodynamic Parameter Analysis

LabSolutions UV-Vis Tm can transfer temperature, absorbance, and time values to an Excel® file in real time during measurements.
By transferring Tm values obtained from samples with different concentration levels to commercial spreadsheet software, changes in Gibbs free energy values used as an index for drug activity levels or thermodynamic properties, such as entropy or enthalpy, can be analyzed easily.





Efficiency

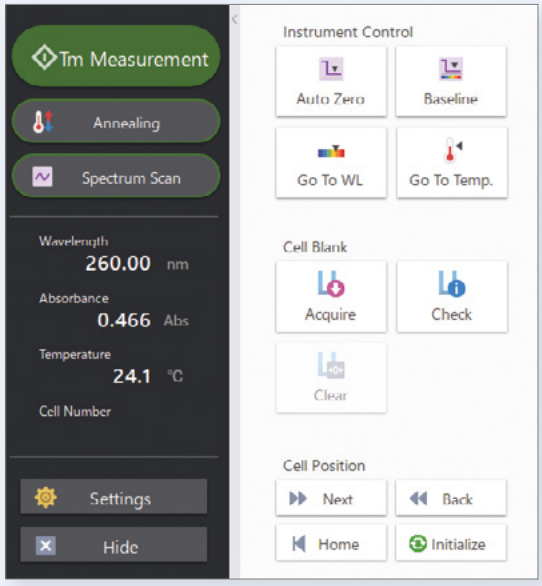
Efficient Automated Workflow

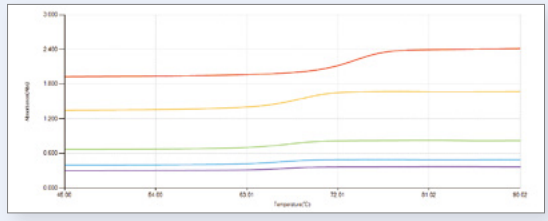
Conventional Tm analysis requires multiple steps, including checking the UV-Vis spectrum, annealing, measuring the melting curve, and analyzing data, with recording and data management performed separately. In contrast, LabSolutions UV-Vis Tm achieves a seamless workflow and efficient Tm analysis by performing time-consuming annealing, correction (background wavelength and temperature blank correction), and Tm value calculation (average or derivative methods) steps automatically.

NEW

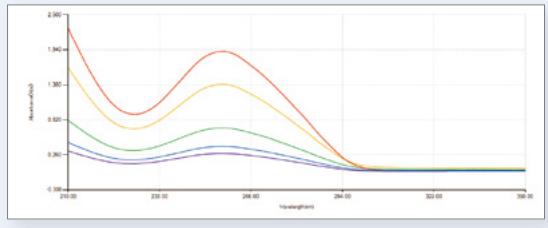
Tm Analysis System

Check data by switching between tabs





Melting Curve



UV-Vis Spectra

One Step

Our conventional method

Measure spectrum

- Risk of switching samples during transition from spectral measurement to annealing/melting curve measurement steps
- Tedious data management because spectral and melting curve data are managed separately

Spectral measurement steps → Annealing/melting curve measurement steps

Anneal

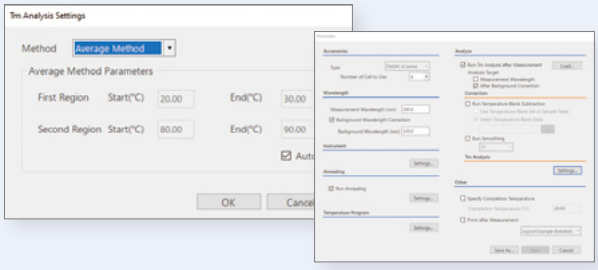
- Annealing temperature must be entered manually each time
- No record of annealing execution is retained
- No record of annealing temperature is retained

For more details, access here.

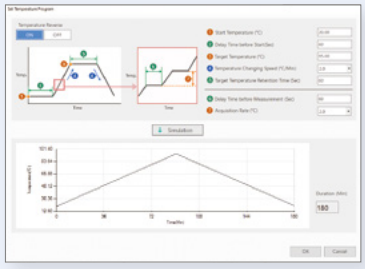
ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technologies, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high-quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.

Easy setting configuration and automatic analysis

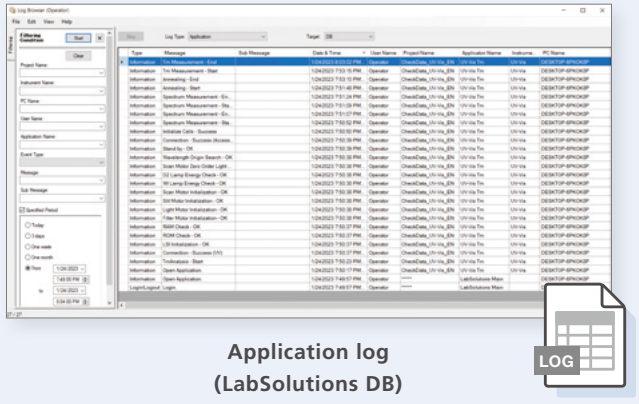


Tm Analysis Settings



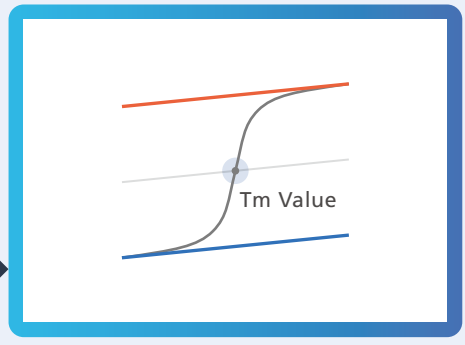
Temperature Program Settings

Retains a record of everything from measurement to analysis



Application log
(LabSolutions DB)

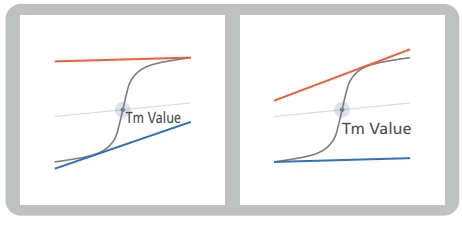
Analysis



Measure Tm values and analyze data

✗ Lack of analysis process/parameter records prevents Tm value reproducibility

Calculate Tm values



✗ Analysis results can vary depending on the analyst

Models Compatible with the TMSPC-8i Cell Holder

Model	Measurement Wavelength Range and Detector	Resolution and Wavelength Accuracy	Monochromator
 **UV-1900i**	190 to 1100 nm Silicon photodiode	1 nm ±0.1 nm (656.1 nmD2) ±0.3 nm (for all regions)	Aberration correction Czerny-Turner mounted Diffraction grating with low stray light Single monochromator
 **UV-2600i** **UV-2700i**	185 to 900 nm Photomultiplier tube 220 to 1400 nm (UV-2600i + ISR-2600Plus) Electron multiplier + InGaAs photodiode	0.1 to 5 nm ±0.1 nm (656.1 nmD2) ±0.3 nm (for all regions)	UV-2600i Czerny-Turner mounted Diffraction grating with low stray light Single monochromator UV-2700i Littrow mounted Czerny-Turner mounted Diffraction grating with low stray light Double monochromator

In addition to the UV-VIS spectrophotometer, TMSPC-8i cell holder, and LabSolutions UV-Vis Tm software, the Tm analysis system also requires a constant temperature water circulator and N_2 (or dry air) purging gas.
For details about equipment requirements, contact a Shimadzu sale representative or distributor.

Tm Analysis and Oligonucleotide Therapeutics Application

For information about Tm analysis system and oligonucleotide therapeutics solutions, visit the following web pages.

Tm Analysis System
https://www.shimadzu.com/an/products/life-science-lab-instruments/dnarna-analysis/tm-analysis-system/index.html

Oligonucleotide Therapeutics
https://www.shimadzu.com/an/industries/oligonucleotide-therapeutics/index.html

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