

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

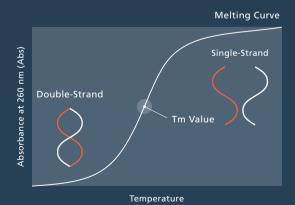
Efficient Automated Workflow

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).



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

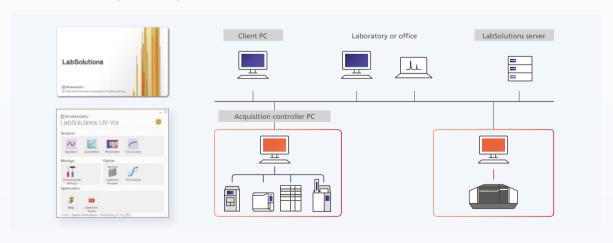
Tm analysis system consists of the following.

• UV-Vis Spectrophotometer



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

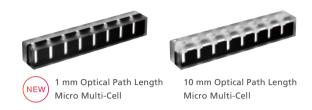
Functionality for Satisfying Various Needs

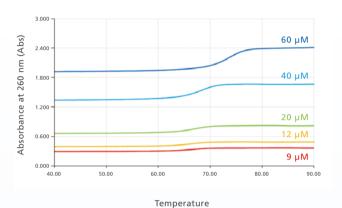
8-Cell Micro Multi-Cell

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 μ L minimum sample volume) for satisfying high-sensitivity measurement needs, a new model with a 1 mm optical path length (with a 10 μ L 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).



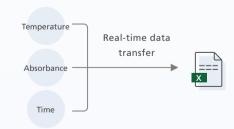


Melting Curve of Nucleic Acid (M13 Primer)
(Using Micro Multi-Cell with 1 mm Optical Path Length)

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.



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	A	8	0	0	E	F	G	H	1	1	K	L	M	N	0		0
1	Sample1	Sample1	Sample1	Sample2	Sample2	Sample2	Sample3	Sample3	Sample3	Sample4	Sample4	Sample4	SampleS	SampleS	SampleS	Sample6	SampleS
2	Tempeat	Wavelength	Time	Tempestu	Waveleng	Time	Temperatu	Waveleng	Time	Tempeatu	Haveleng	Time	Temperatu	Waveleng	Time	Tempeatu	Wavelengt
3	25.40	0.000864	. 0	15-25	0.293406	. 5	15.2	0.392526	12	15-17	0.659082	16	35.17	1.330233	25	15-34	1.908708
4	16	0.001045	179	16	0.292946	185	15.99	0.392546	192	15.98	0.658751	296	35.99	1.330013	205	15.97	1.907722
5	17.01	0.000996	359	17.02	0.292895	366	17.01	0.392452	372	17	0.658837	376	16.99	1.330658	385	17.01	1.909467
5	17.97	0.000935	540	18.03	0.293347	547	17.99	0.292255	553	17.98	0.658991	550	37.98	1.330794	564	38	1.909005
7	18.99	0.00114	721	18.97	0.293375	726	18.99	0.392632	732	18-98	0.85929	736	19.01	1.33116	743	18-01	1.910125
8	20.01	0.000837	894	20	0.293561	900	20	0.392767	906	20.00	0.659506	913	20.01	1.333724	917	25.59	1.941133
9	20.96	0.00091	1068	20.98	0.293462	1074	20.90	0.392994	2079	21	0.659777	1089	20.98	1.332279	1091	25.59	1.910968
10	21.90	0.000866	1242	22.02	0.29352	1247	21.90	0.292966	1253	21.59	0.660229	1250	21.98	1.332616	1264	23.57	1.911354
11	21	0.00002	1416	22.98	0.293658	1422	22-96	0.393245	1429	23.01	0.659538	1434	21	1.333116	1439	23.63	1.912645
12	24	0.000817	1990	23.99	0.293613	1596	24.01	0.393303	3502	23.99	0.660204	1607	23.98	1.333572	1613	23.99	1.912002
13	24.90	0.000739	1765	25	0.293808	1771	25/01	0.393444	1776	25.00	0.660295	1782	24.98	1.333694	1768	24.58	1.913574
14	25.90	0.000694	1939	26.01	0.294134	1945	26	0.393421	2951	25.99	0.660684	1956	25.99	1.334466	1962	26	1.913332

Efficient Automated Workflow

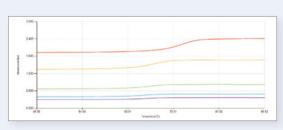
Conventional Tm analysis requires multiple steps, including checking the UV-Vis spectrum, annealing, measuring the melting curve, and analyzing data, with recording and data management performed separately. In contrast, LabSolutions UV-Vis Tm achieves a seamless workflow and efficient Tm analysis by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

Check data by switching between tabs

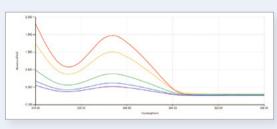


Tm Analysis System





Melting Curve



UV-Vis Spectra

One Step

Measure spectrum

Risk of switching samples during transition from spectral measurement to annealing/melting curve measurement steps

X Tedious data management because spectral and melting curve data are managed separately



steps

Annealing/melting curve measurement

Anneal

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

Our conventional method

For more details, access here.

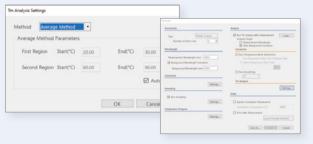




- Automated support functions utilizing digital technologies, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition
 without user input, and automatically 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

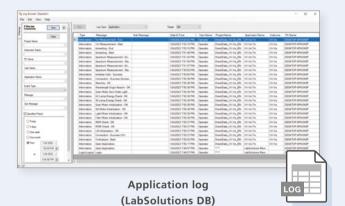
Retains a record of everything from measurement to analysis

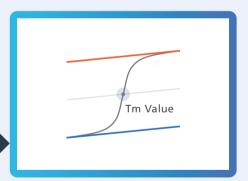


Tm Analysis Settings



Temperature Program Settings



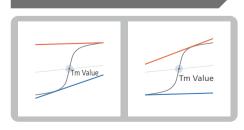


Analysis

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 N2 (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-labinstruments/dnarna-analysis/tm-analysis-system/index.html



Oligonucleotide Therapeutics

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

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