

EXSTAR SERIES

Expandable SIINT Thermal Analysis & Rheology



SII NanoTechnology Inc.

SII NanoTechnology Inc. is the pioneer in high resolution, high sensitivity and high reliability thermal analysis instrumentation. Providing users with high performance thermal analyzers with easy operation, the EXSTAR series of thermal analyzers give you the confidence to achieve fast, accurate, reproducible results.



EXSTAR Network

The EXSTAR series provides complete solutions for the characterization of Thermal Properties. It covers all methods of Thermal Analysis incl. the measurement of the viscoelastic behaviour.

A variety of applications is supported by the environment control measurements like the evolved gas analysis (EGA), photochemical reactions and real time sample observation.

Sample throughput can be increased by hard- and software by the use of auto sampler, auto analysis feature and highway Thermal Analysis.

The EXSTAR series meets the today's requirements completely and covers future needs.

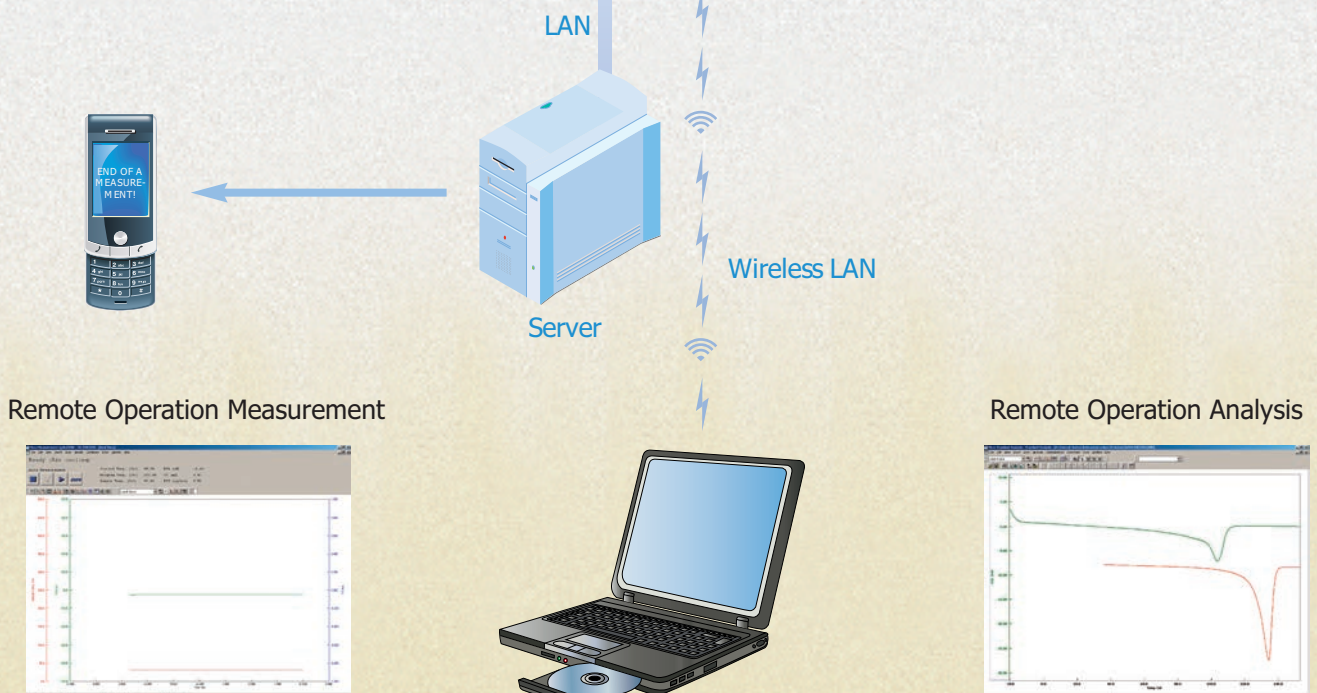


Easy&Comfort Muse Mobile Station

Muse Mobile Station Software can be installed on your Desktop PC or Notebook and realizes the same working environment as if you are in the laboratory using wired or wireless LAN.

Monitor and control your measurement from the far.

The measurement status can be notified by e-mail or pop up message on your computer or mobile phone.



„Start“, „stop“ and the condition change etc can be controlled from your PC

Data analysis after/during the measurement can be performed from your PC

Differential Scanning Calorimeter

DSC

High Performance Heat Flux DSC



Differential Scanning Calorimetry is the most fundamental technology in the field of Thermal Analysis. SII Nano Technology Inc. is the pioneer in developing and manufacturing heat flux type DSC for more than 25 years. The EXSTAR series DSCs are designed for high performance in sensitivity, resolution, baseline stability and reproducibility.

The EXSTAR series offer unsurpassed benefits due to the unique flexibility and application related design characteristics. The newly designed X-DSC 7000 sensor multiple thermocouples guarantee high sensitivity, while the centric heat-flow method provides uniform and stable to sample and reference and therefore extremely stable baselines. The exclusive oval sensor of the Standard DSC 7020 with its inner and outer heat sink guarantees the shortest heat path to keep the ideal temperature distribution between sample and reference platforms. It provides high resolution and sensitivity together with reproducible and flat baselines. Both sensor designs make it possible to offer the best suited DSC system for customer's application in quality control and high grade R&D measurements.



DSC7020



X-DSC 7000



DSC with RV

DSC 7020

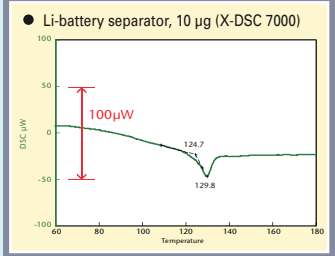
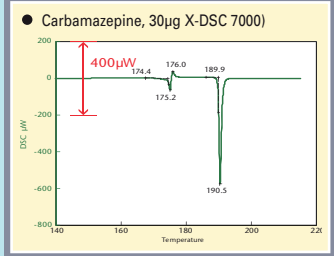
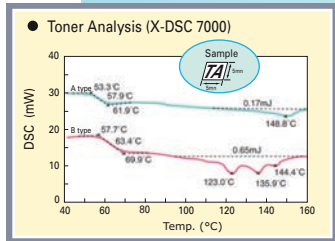
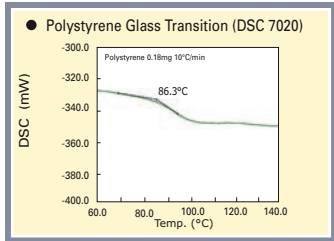
This DSC 7020 is the working horse of the 7000 series DSC systems. It is specifically well suited for polymers. The unique sensor design allows high resolution and sensitivity together with high, but controlled cooling and heating rates. The baseline performance makes any corrections unnecessary and therefore allows the use of the easy to operate auto samplers in R&D and QC applications.

X-DSC 7000

X-DSC 7000 improves the reliability of data due to the superior sensitivity and repeatability with enhanced expandability. It is ideal for a variety of applications including small samples, pharmaceutical products (drug discovery, impurity analysis), membranes, paint films, food and biomaterials (dilute solutions). The newly designed furnace allows faster heating and cooling rates and enables accurate temperature down to the low temperatures. Even with electrical cooling systems temperatures of -120°C can be achieved.

Flexibility

The 7000 series is the most flexible system in respect of cooling systems, auto samplers and accessories. The real view option and the Photochemical Reaction accessory make sure all DSC user desires are fulfilled.



Auto Sampler

The highly reliable, easy to operate auto sampler units bring automation, efficiency and high throughput to your laboratory. The 50 position sampler with its patented four finger system guarantees the highest position accuracy for accurate and reliable results, removing human errors. Copying functions and auto analysis software free the user from any routine work.



Flexible Cooling Systems

For the 7000 series DSC systems one can choose from different electrical cooling units. The temperature ranges from -40, -80 and -110°C are available. The liquid nitrogen cooling accessory covers the whole temperature range from -150 to 725°C without any compromise. Pressurised air can be used for temperatures above ambient and the cooling can rapidly cool down the DSC cell after a measurement to temperatures of -170°C.



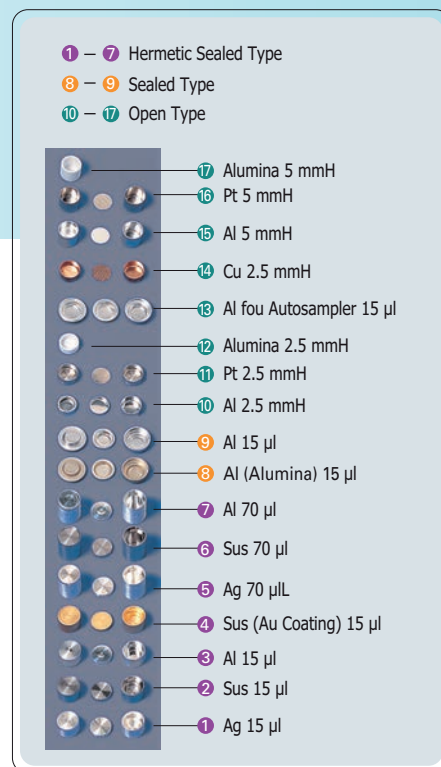
Accessories and Options

The sample colour and shape is recorded by the visualization system RV-1D. Pictures are linked to the DSC curve. Photochemical reactions, like curing, are measured as a function of reaction gas, irradiation intensity and wavelength.

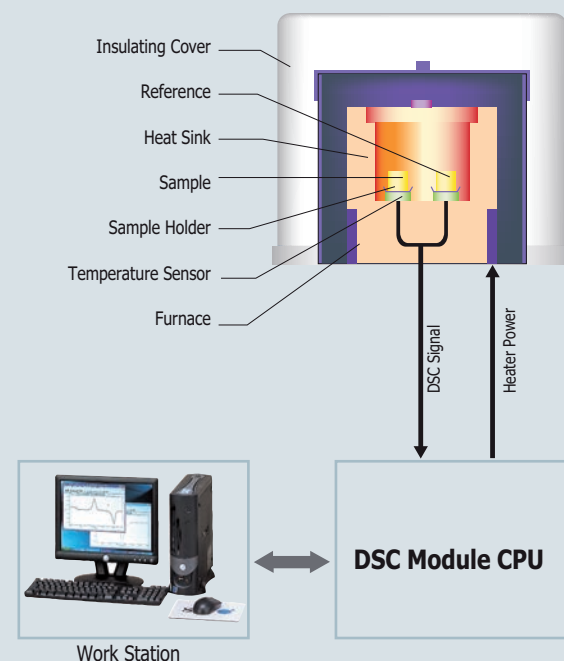


Variety of sample containers

Crucibles are available from different materials like aluminium, platinum, ceramics, silver or stainless steel as open, crimped, sealed or hermetically sealed types of a pressure resistance of up to 80 bars.



Diagram



Theory of Operation

Heat flux DSC detects the difference in heat flow which is supplied to the sample and reference uniformly. The sample and reference are heated or cooled by heat flow from the heat sink through the temperature sensors. Since the heat sink has a much larger total heat capacity in comparison to the sample and reference, the heat flow in or out of the sample is proportional to temperature difference between the sample and reference holders. This heat flow is quantitative and displayed as a y-axis signal in mW.

Specification

Model	DSC 7020	X-DSC 7000
DSC Type	Heat Flux DSC	
Temperature Range	-170 ~ 725°C	-150 ~ 725°C
RMS Noise	0.1 µW	0.05 µW
Sensitivity	0.2 µW	0.1 µW
Scan Rate	0.01~100°C/min	
50-Position Autosampler	Optional	Optional
	Flow Meter	
Purge Gas Controller	Gas Control Unit (2-Channel) Mass Flow Control Unit (1-Channel or 2-Channel)	
	Open: 100 µL	
Sample Pan Capacity	Hermetic sealed: 15 µl	Hermetic Sealed: 70 µL
	Sealed: 7.5 µl	Sealed: 7.5 µl
Auto LN ₂ Cooling System	Optional (-150 ~ 725°C)	-150 ~ 725°C
Electrical Cooling Systems	Optional (-70°C ~ 420°C)	C Type: -80 ~ 500°C
Cooling Can	-180 ~ 725°C	-

Thermo Gravimetry / Differential Thermal Analyzer

TG/DTA

Pioneer of Digital Dual Beam TG/DTA Technology



SIINT is one of the earliest Thermal Analysis suppliers offering simultaneous instruments, combining the high flexibility of the differential temperature analysis (DTA or DSC) and the proven capabilities of the thermo gravimetry (TGA) with dual beam TG/DTA technology. EXSTAR 7000 TG/DTA series feature a proven dual balance beam design, which is highly resistant to environmental influences such as temperature fluctuations and table and building vibrations. This guarantees a drift free baseline without chimney and convection effects.

The newly developed ERATO calibration wizard performs automatically the full calibration of the system. This drastically improves the DTA/DSC performance without service interaction and furnace adjustment.

EXSTAR 7000 series TG/DTA allow you simultaneous TG/DTA and TG/DSC measurements, providing information about decomposition temperature, compositional analysis, flammability study, oxidative stabilities, and transition temperatures. The horizontal dual beam design ensures that the sample is exposed in the identical thermal environment and the desired atmosphere to obtain highly reliable data.



TG/DTA 7200

Ideal Environment Control Technology

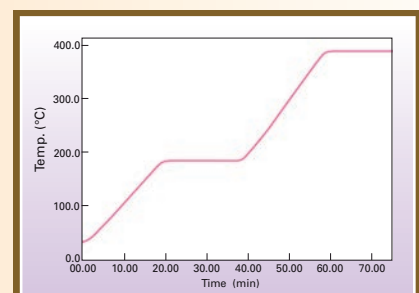
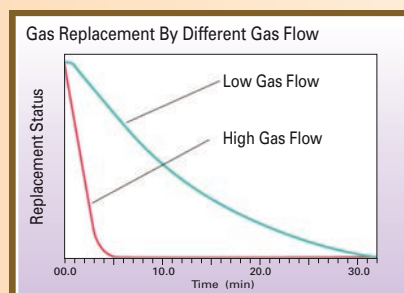
In the horizontal dual beam balance the gas flow is perpendicular to weight measurement. This means that there is no interaction of reaction gas flow on the mass signal, even at flow rates up to 1000 ml/min. This allows the user to measure even minor weight losses at very low mass samples in a controlled atmosphere without any baseline correction.

Outstanding Sensitivity and Accuracy

The SIINT digital dual beam technology is the only one which guarantees accurate compensation of Thermal Expansion effects of the balance beams. The "Fuzzy Logic" temperature control in and the low mass furnace together allow for a precise temperature control, prevents overshoots and therefore enables the Controlled Rate Thermal Analysis (also called Sample Controlled Thermal Analysis).



AST-3



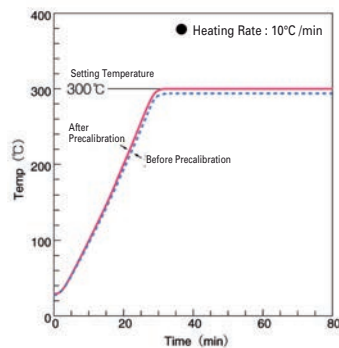
High Reliability, Compact Autosampler

This robotic system allows up to 50 samples to be measured and analyzed automatically. The user can run any combinations of samples and methods, as the 7000 series of TG/DTA's do not need any method specific baseline corrections, unlike most other TGA's.



Pre-Calibration Function

EXSTAR 7000 series TG/DTA software provides direct temperature calibration, pre-calibration functions by using high purity metal standards. The thermocouple is in direct contact with the sample platform which ensures highly accurate temperature readings. With the multiple points pre-calibration, the most accurate temperature control over a wide temperature range can be achieved. The calibration of the temperature control works as a "just press a key" function can be performed and saved under various experiment conditions and therefore saves maintenance costs.



One Touch Designed Dual Balance Beam

The patented one touch type dual balance beam design allows users to exchange the beam by themselves easily. Light weight balance beam ensures EXSTAR 7000 series TG/DTA with the highest sensitivity and stability.

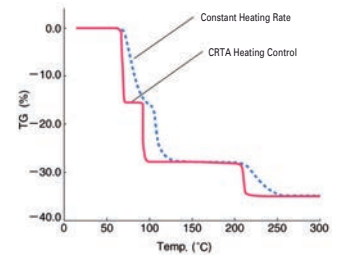


Specification

Model	TG/DTA 7200	TG/DTA 7300
Temperature Range	Ambient ~ 1100°C	Ambient ~ 1500°C
Balance Type	Horizontal Digital Dual Beam Type	
TG Measurement Range	± 400 mg	
TG RMS Noise / Sensitivity	0.1 µg / 0.2 µg	
DTA Measurement Range	± 1000 µV	
DTA RMS Noise / Sensitivity	0.03 µV / 0.06 µV	
Programmable Rate	0.01 ~ 100°C/min	
Automatic Cooling Unit	Forced Air Cooling	
Cooling Time	1000 °C ~ 50 °C Within 12min	
Sample Pan Material	Platinum, Alumina, Aluminum	
Maximum Sampler Weight:	200 mg	
Atmosphere	Air, Inert Gas, Vacuum (10 ⁻² Torr)	
Purge Gas Flow Rate	0 ~ 1000 ml/min	
50 position Auto Sampler	Optional	

Controlled Rate Thermal Analysis (CRTA)

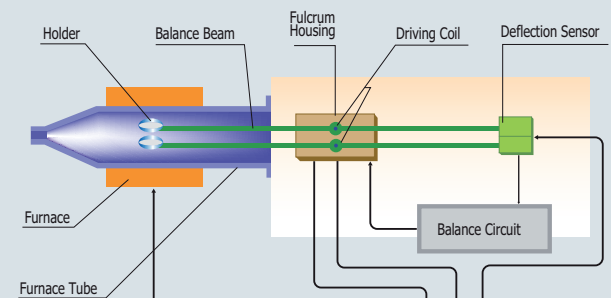
Controlled Rate Thermal Analysis (CRTA, also called Sample Controlled Thermal Analysis SCTA) is equipped as a standard. This technique allows the control of the heating rate as a function of the weight loss. This method allows the separation of close weight losses without reducing the heating rate to 1 or 2°C/min. All settings are user selectable and the control of the heating rate is totally user unattended.



Reactive Atmosphere Handling

A separate purge port for aggressive reaction gases is available. By the use of this optional gas inlet port corrosive reaction gases can be used without a damage of the balance mechanism.

Diagram



Work Station

TG/DTA Module CPU

Theory of Operation

The Exstar 7000 series uses two independent zero-position micro balances. The output signal is the difference between sample and reference balances. Therefore only the true sample mass change is measured, eliminating any environmental effects. Two thermocouples measure the temperature difference between sample and reference holders. This temperature difference is proportional to the heat flow in or out of the sample.

Thermo Mechanical Analyzer/Stress Strain TMA/SS



TMA measures the dimension change of a sample under defined conditions. Those are temperature, atmosphere and the applied force. The SIINT TMA offers a variety of different load modes and the necessary accessories. Probes are available for compression, penetration tension and three point bending. The unique stress/strain control allows measurements as a function of load and sample dimension. Therefore one can determine the stress relaxation and the creep recovery characteristics of a sample. This instrument was developed with DMA capabilities and therefore the characterization of the viscoelastic behaviour is one of the standard features. CRTA (Controlled Rate Thermal Analysis) and large volume TGA complement the TMA/SS measurement modes. It's simply the best and most flexible TMA!

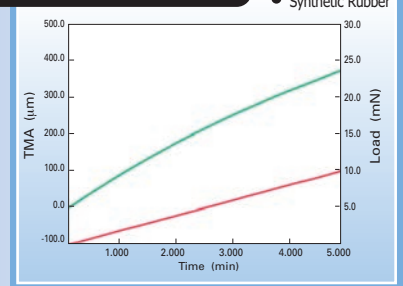


TMA/SS 7300

Unique Flexibility

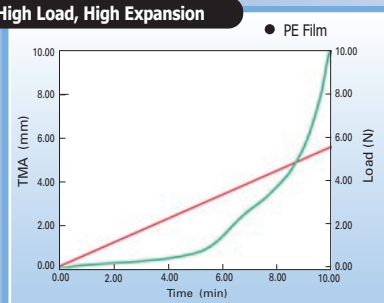
EXSTAR series TMA/SS 7000 series offer the broad load range from 0.01mN to 5.8 N to afford measurements ranging from single fibres to stiff bulk compositions. The large displacement range of +/-5000 µm allow EXSTAR 7000 series TMA users to handle a wide range of samples and applications without caring for sample dimensions. All kind of samples – polymers, ceramics, metals and glasses can be characterized in the large temperature range from -150 to 1500°C.

2. Low Load



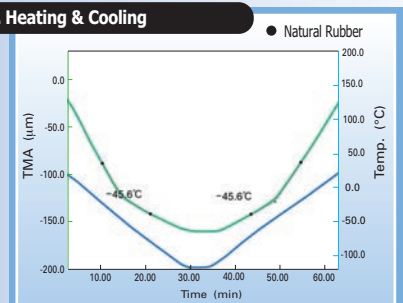
Able to Control Low Load Linearly (<10mN)

1. High Load, High Expansion



Wide Range Measurement Is Realized, Load (5.8N), Expansion (10mm)

3. Heating & Cooling



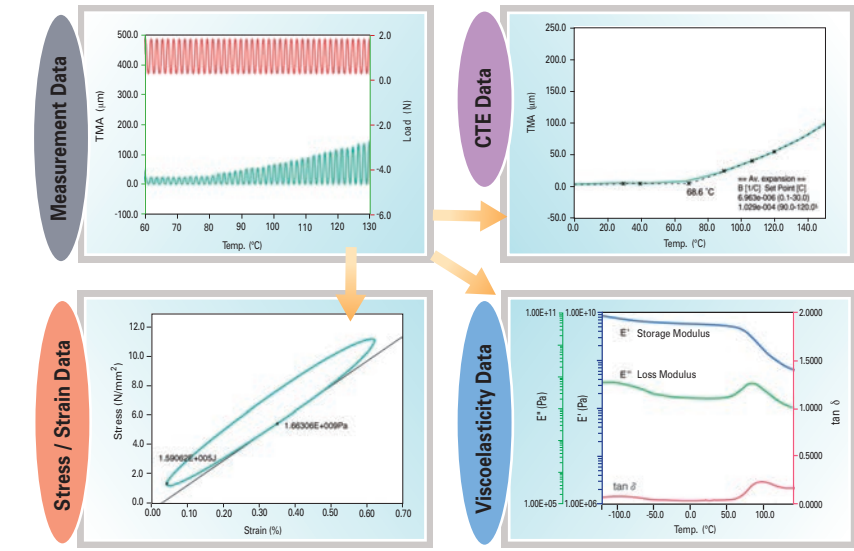
Excellent Heating & Cooling Performance

▶ Outstanding Sensitivity

The precise and accurate measurement of the coefficient of thermal expansion depends on factors like temperature calibration resolution and sensitivity. With the 20 point temperature calibration, the resolution in the nm range and the unsurpassed temperature resolution the TMA/SS from SII NT fulfil all those needs.

▶ DMA Capabilities

The SIINT TMA can also be used as a DMA. Sinusoidal force can be applied to the sample, the phase shift between force and the deformation signal precisely analyzed with Fourier Transformation and therefore the viscoelastic behaviour can be characterized.



▶ Melting Protection Function

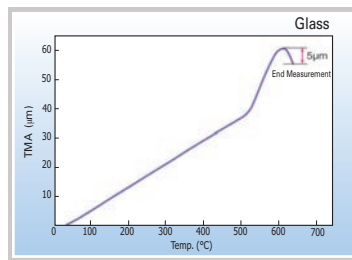
In order to protect the sample holder and the probes, the TMA/SS is equipped with the function to shut down the measurement if user defined displacement ranges are exceeded.

▶ Automatic Sample Length Measurement

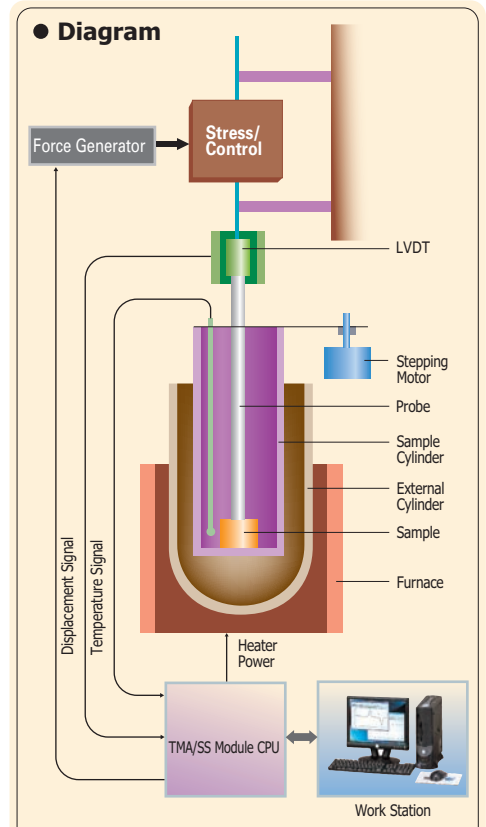
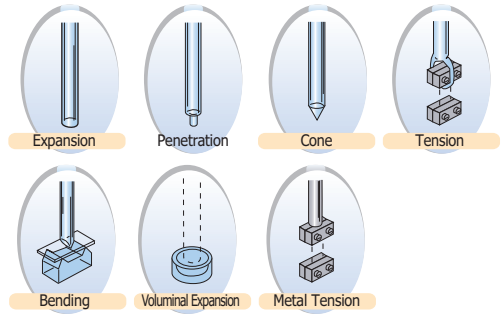
When the measurement starts, the sample length or thickness is automatically measured by the instrument under defined loads and temperature conditions. This function is easy to use, eliminates human error in handling micrometers and ensures highest accuracy.

▶ High Volume TG

The TMA can be used as a high mass, high volume TGA with a max sample mass of 600 g and a maximum volume of 2 ml. (USA Patent 5826983).



A Wide Range of TMA Probes



Theory of Operation

The key components of the instrument are the force generator, high sensitivity LVDT displacement detector, step motor and the stress strain control. The vertical design guarantees direct contact between force generator and the sample via the probe and very low compliance of the system, while the LVDT precisely measures the position of the magnet in the centre of the detector. The step motor records the position of the sample cylinder while the LVDT measures the position of the probe. The difference of both signals reflects the sample dimensions. This principle allows the measurement of the sample dimensions in the instrument before the run is started.

TMA/SS Specification

Model	TMA/SS 7100	TMA/SS 7100 (1100 °C)	TMA/SS 7300
Temperature Range	-150 ~ 600°C	Ambient ~ 1100°C	Ambient ~ 1500°C
Sample Cylinder	Quartz, K-type TC	Quartz, R-type TC	Alumina, R-type TC
Probe	Quartz	Quartz	Alumina
Automatic Cooling Accessory	Forced air or liquid nitrogen vaporization method Electrical cooling system	Forced air cooling method	Forced air cooling method
Probe Supporting Method	Cantilever and spring support		
TMA Measurement Range	±5 mm		
TMA RMS Noise / Sensitivity	0.005 µm / 0.01 µm		
Load Range (Sensitivity)	±5.8N (0.01 mN)		
Scan Rate	0.01 ~ 100°C		
Sample Length	Automated measurement		
Loading Program Mode	Constant: ±5.8 N Linear: 0.01~10 ⁷ mN/min Sine: 0.001~1Hz Combination (max: 40 Step)		
Displacement Mode	Constant: ±5000 µm Linear: 0.01~10 ⁶ µm/min Sine: 0.001~1Hz Combination (max: 40 Step)		
Dimensions	39 x 55 x 74 cm		
Atmosphere	Air, Inert gas, Vacuum (1.3PA)**, Swelling**, Humidity Control**		

** The value used when the heater is working is based on the measurement condition of SII NanoTechnology Inc. Standard.

High Volume TG Attachment	
TG Range	± 600 g
Sample Cup	2 ml
Temperature Range	-150 ~ 1500 °C
Noise level	<1 mg

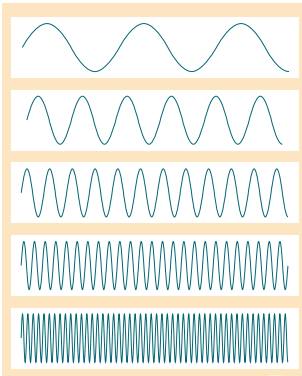
Dynamic Mechanical Spectrometer DMS



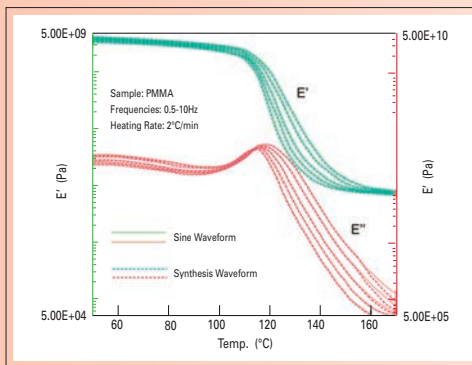
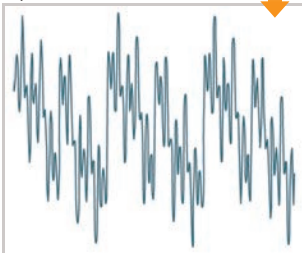
The Dynamic Mechanical Analyzer measures the viscoelastic properties of a sample as a function of frequency, time, temperature, stress, strain and the environment. All parameters are chosen by the user to provide the desired information of the molecular structure of the specimen.

The combined benefits of the spring support system, high resolution LVDT, heavy-duty stiffness of the instrument and the force range of up to 18 N will provide accurate information on very thin films as well as on stiff, thick, reinforced polymers. Different deformation modes allow measurements in the range from 103 to 1012 Pa.

Different Sine Waveform

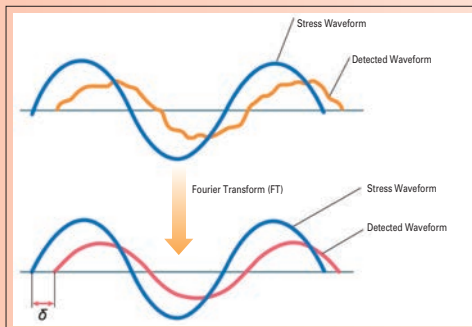


Synthesis Waveform



Synthetic Oscillation Mode

In this mode multiples of the basic frequency are overlaid and the results calculated using the Fourier transformation. The advantages are evident. Samples can be measured at up to five frequencies at high data collecting rates with higher heating rates. This technique allows the frequency multiplexing even on samples which undergo drastic softening in a very narrow temperature range.

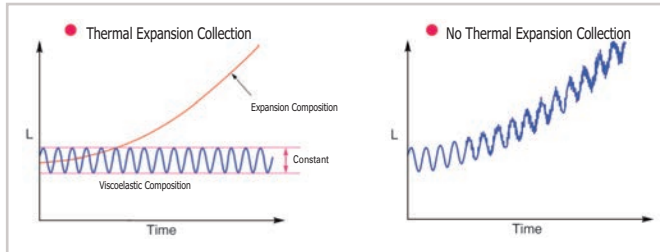


Fourier Transform (FT)

The EXSTAR DMS uses the Fourier Transform approach to analyze the strain signal with the highest possible resolution. This allows precise phase angle measurements at low levels with very small deformation amplitudes. This greatly enhances the measurement range for stiff and very soft samples all with one instrument.

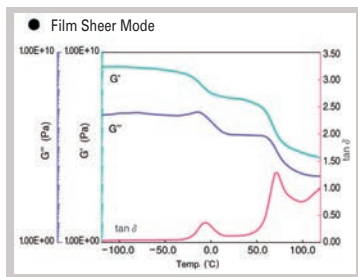
Thermal Expansion Correction Function

During measurements in the wide temperature range (-150 to 600°C) samples undergo thermal expansion, shrinkage and creep. The highly accurate step motor automatically compensates the dimensional changes and makes sure the applied force is always the desired one, pre-tension is correct and the LVDT stays in its measurement range. This patented technique (USA Patents 4967601, 5046367, 5154085, 5182950) guarantees highly accurate and reliable data.



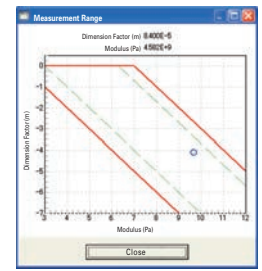
Wide Measurement Range

All deformation modes are available including dual and single cantilever bending, shear and film shear, three point bending for stiff samples and tension for thin film and single fibres with diameters down to a couple of μm . The sophisticated auto tension mode reduces the pretension during softening.



Advanced DMS Software

The advanced software package includes geometry depending subtraction, generation of master curves and calculation of activation energy as standard.



Easy to confirm measurement range

The unique Test Mode function makes it easy for the operator to determine the best suited sample geometry and to choose the best deformation mode for his sample.

Multiple Deformation Modes

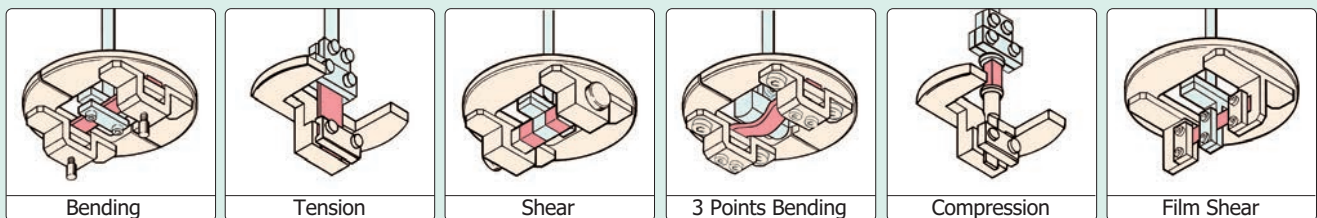
As standard the DMS 6000 comes with the 20 mm dual cantilever bending and the tension head. To be able to measure samples with different characteristics a variety of optional heads are available. This ranges from dual and single cantilever with different active lengths, 3 point bending, shear and film shear, to tension and compression. This allows characterization of all sample shapes from single fibres to stiff bulk samples.

Diagram

Theory of Operation

The EXSTAR DMS6100 is able to apply a dynamic force with various frequencies. The force generator applies the force to the sample and the deformation is measured by using a linear differential transformer (LVDT). The relevant signal for viscoelasticity is calculated and derived from the phase shift between stress and strain. The length deformation caused by creep and thermal expansion of the sample is compensated by the thermal expansion correction function.

A Wide Range of DMS Probes



DMS6100 Specification

Deformation Modes	Bending	Tension	Shear	Film Shear	Compression	3 Point Bending
Measurement Modes	Dynamic measurement: Sine wave oscillation mode / Synthesis wave oscillation mode Static measurement: Program stress control / Program strain control					
Frequency	Sine wave oscillation: 0.01-200Hz (Max.13 frequencies), Synthesis wave: oscillation: Max.5 frequencies					
Measurement Range	$10^5 \sim 10^{12}$ Pa	$10^5 \sim 10^{12}$ Pa	$10^3 \sim 10^9$ Pa	$10^7 \sim 10^{11}$ Pa	$10^5 \sim 10^9$ Pa	$10^5 \sim 10^{12}$ Pa
Temperature Range	-150°C ~ 600°C					
Program Scan Rate	0.01 ~ 20°C/min					
Sample Dimension Length:	Length: 50mm Thickness: 5mm Width: 16mm	Length: 5 ~ 35mm Thickness: 3mm Width: 10mm	Cross section: 10mm ² Thickness: 7mm	Length: 50mm Thickness: 0.5mm Width: 10mm	Length: 15mm Diameter: 10mm	Length: 50mm Thickness: 5mm Width: 16mm
Force Range	Static: +/-9.8N, Dynamic: +/-7.8					

EXSTAR series of Thermal Analyzers

Photo Chemical Differential Scanning Calorimeter

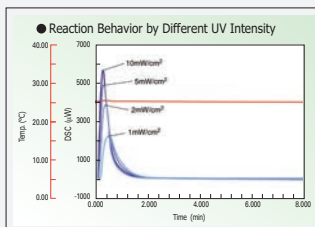
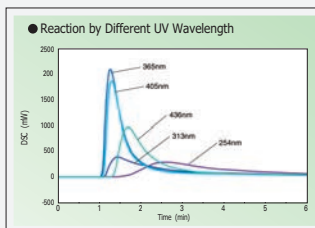
PDC

PDC-7 Photo Chemical Reaction DSC



EXSTAR series of Thermal Analyzers

As innovative company SIINT has developed the first specially designed PDSC system for the measurement and analysis of photochemical reactions. Following the market needs the PDC 7 was developed. This is a specially designed attachment to the DSC 7000 series systems. It combines the advantages of a high sensitive DSC, with the needed high resolution requirements of the measurement of the fast photocuring reactions with the technology of the light transfer via glass fibres and therefore the possibility of having the high light intensities of than 500 mW/cm². It is very simple to change the intensity and the wavelength. As known the atmosphere is controlled in the usual way in the DSC reaction chamber. The DSC can be used in the normal way for standard applications.



PDC Specification

Model	PDC-7
Temperature Range	Ambient ~ 150°C
Measurement Range	± 100mW/± 300 mW
Atmosphere	Air, Inert gas
Lamp	Hg / Xe: 200W
Wave Length Adjustment	By Filter
Irradiation Intensity	500mW / cm ² or better
Irradiation Intensity Adjustment	Adjustable ND Filter
Irradiation Time	0.1 sec ~ 100h
Shutter Control	Auto Mode/Manual Mode

Environment Control System

For TMA/SS, DMS and TG/DTA accessories for measurement in controlled humidity are available. TMA/SS and DMS are prepared for measurements in liquids. (USA Patent 5669554)

Humidity Control Measurement in Liquid TMA/SS

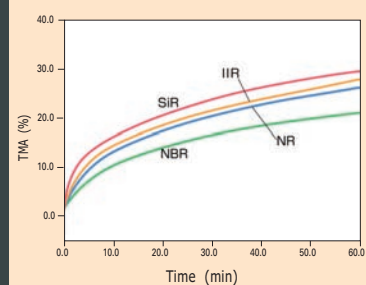
Humidity Control Measurement in Liquid DMS

Humidity Control TG/DTA

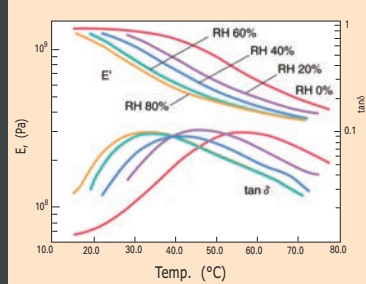
Environment Control Unit

- Humidity Control Unit
- Measurement in liquid

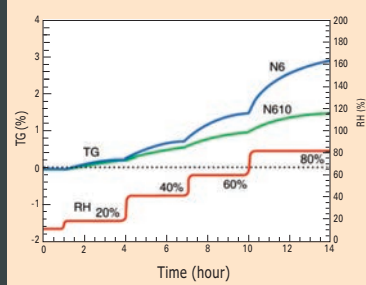
► Rubber Expansion Inside Different Solvents



► Nylon 12 DMS Measurements in Different Humidity



► Polyamide TG Humidity Control Measurement

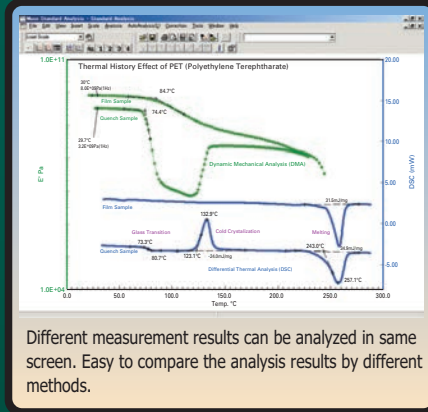


Easy Operation

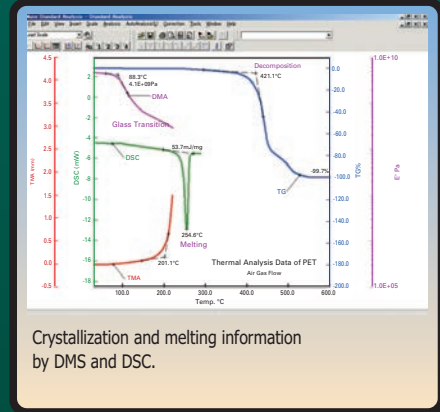
New Software Package MUSE

Innovative Technology - Multi Module Analysis

Perform simultaneous analysis of different techniques in one diagram.



Different measurement results can be analyzed in same screen. Easy to compare the analysis results by different methods.



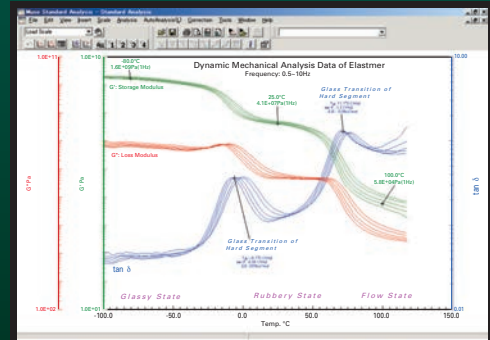
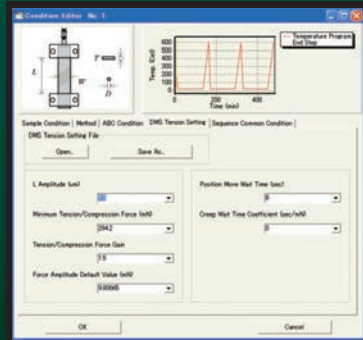
Crystallization and melting information by DMS and DSC.

Customized Performance

1. Selection of all operation icons to your own needs
2. Arrangement of the layout according the measurement conditions

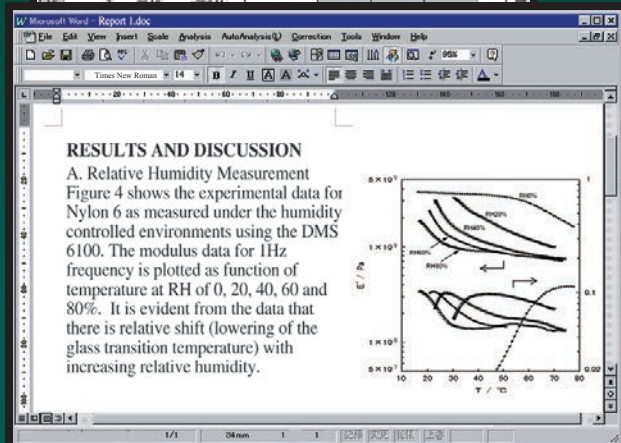
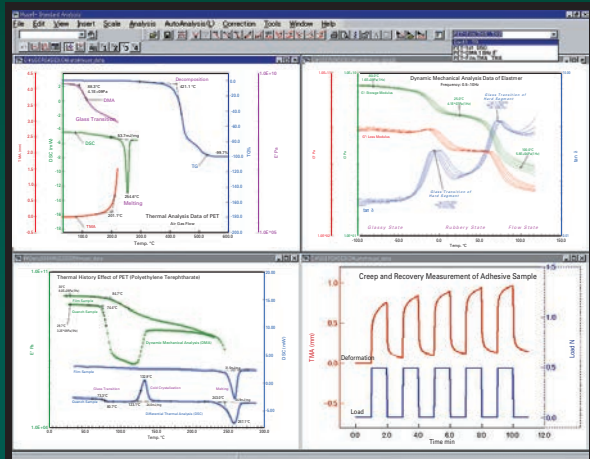
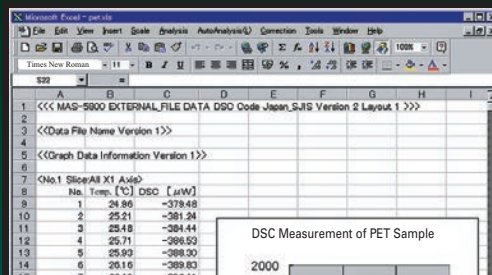
Free Axis scaling

Analysis results can be moved, enlarged and customized freely using SIINT patented technologies.



Simplify Your Analysis

MUSE software is designed to work in Windows® OS environment. The analysis results are exported to Word® and Excel® with one mouse click. The user is free to use other commercial software for further calculation and display.



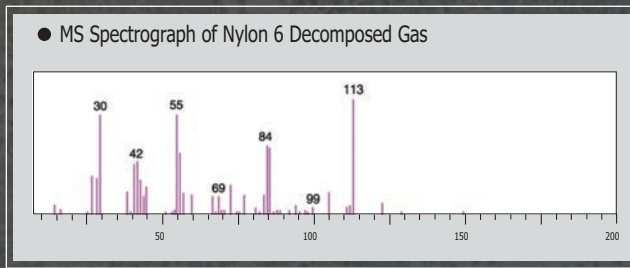
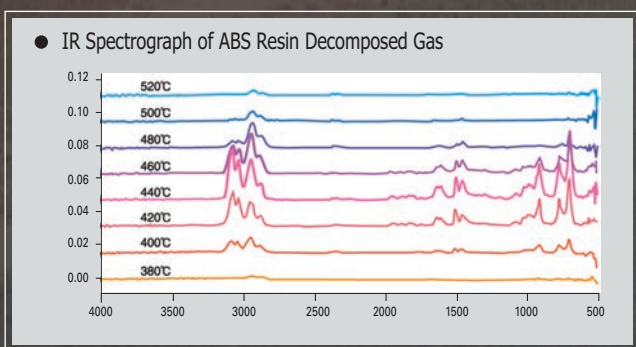
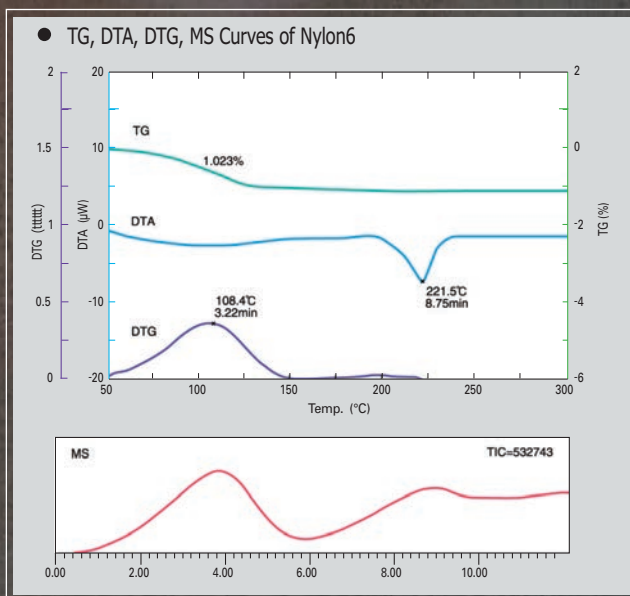
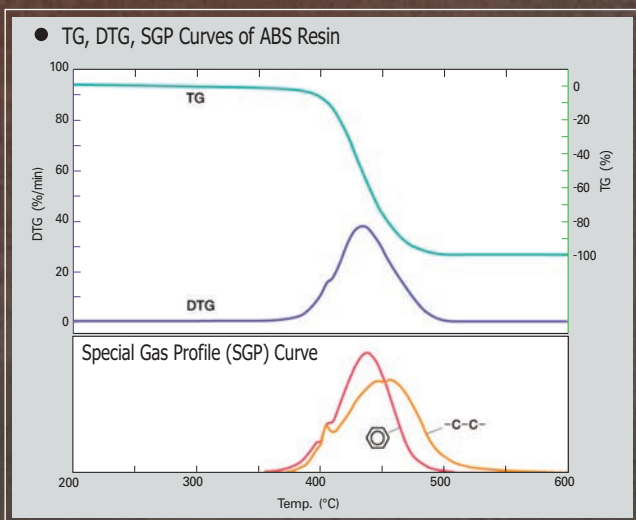
EXSTAR series of Thermal Analyzers

Excellent Expandability

Simultaneous Analysis of TG/DTA and MS, FT-IR or GC / MS

EXSTAR series of Thermal Analyzers

The EXSTAR TG/DTA can be hyphenated with MS, FT-IR and GC/MS. SIINT can provide the required interface technology. Large gas flow design ensures the analysis can be realized with high accuracy with minimal lag time.



Advanced Analysis Technology with TG/DTA

Connect Analyzer	FT-IR	MS	GC/MS
Real Time Measurement	OK	OK	No
Detection Sensitivity	High	High	High
Resolution			
1. Gas with low molecular weight	High	High	Normal
2. Gas with high molecular weight	High	Normal	High
Carrier Gas	No limited	He (Recommend)	No limited
Interface	Gas transfer line and Gas cell	Gas transfer line with ionized atmosphere	Gas collecting unit and transfer unit

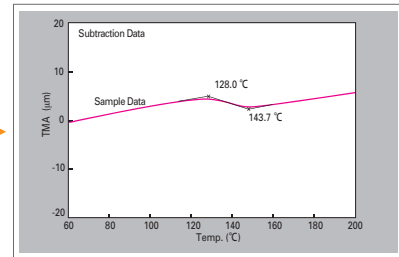
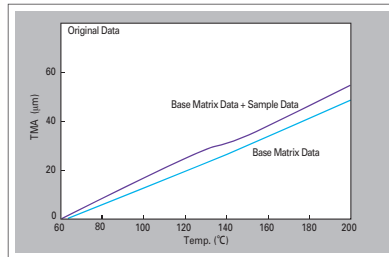
Gas Transfer System Specification

Model	EXSTAR 7000 series TG/DTA
Temperature Range	Ambient - 300 °C
Temperature Control	2 System: Gas transfer line heater Outer heater
Gas Transfer Line	Diameter: 1/16 inch SUS tube 1.5 m
Connection Jointer	Diameter: 1/16 inch SUS tube
Carrier Gas Flow	Max. 1000 ml/min

Advanced Software Package

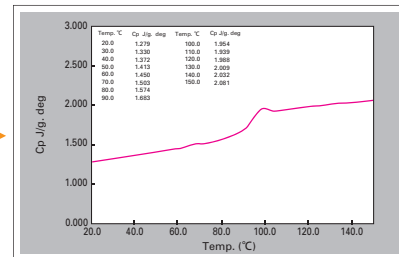
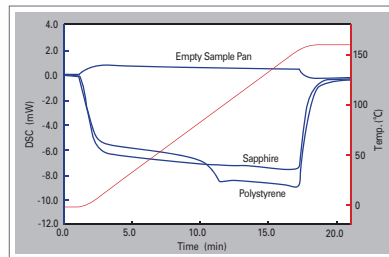
Subtraction Function

Two data files can be subtracted to eliminate influences from substrates and to enhance the resolution.



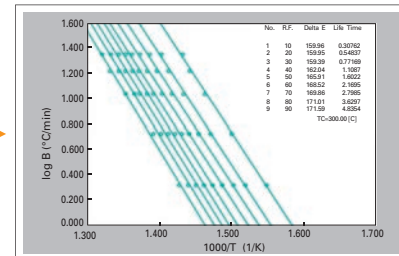
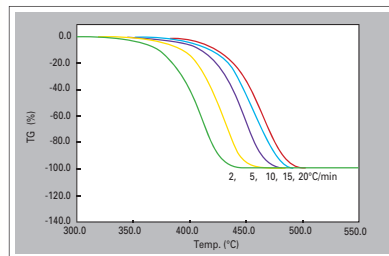
Specific Heat Calculation

Calculates specific heat capacity from DSC measurement data.



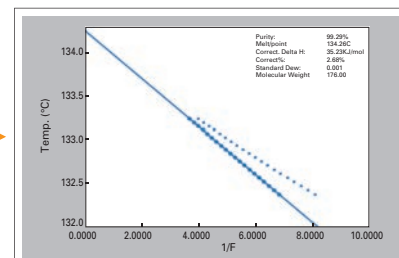
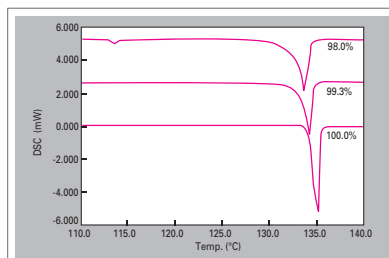
Activation Energy Determination

Calculates the reactions activation energy to estimate lifetime.



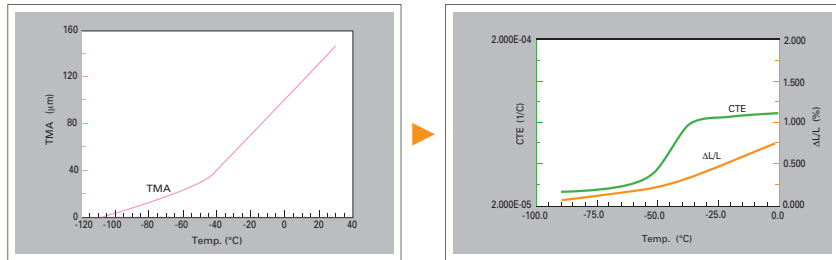
Purity Study

Calculates the sample purity using the DSC curve trace and slope.



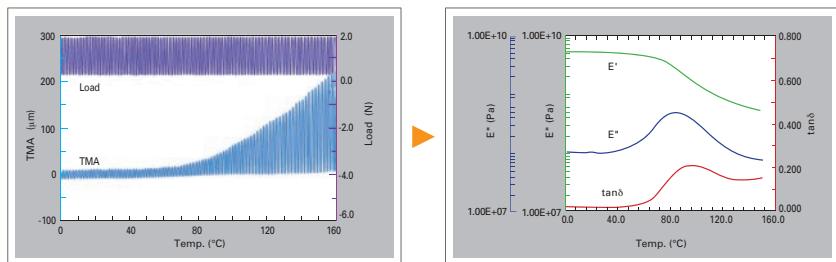
Expansion Analysis

The coefficient of thermal expansion (CTE) and its changes are displayed as a function of temperature.



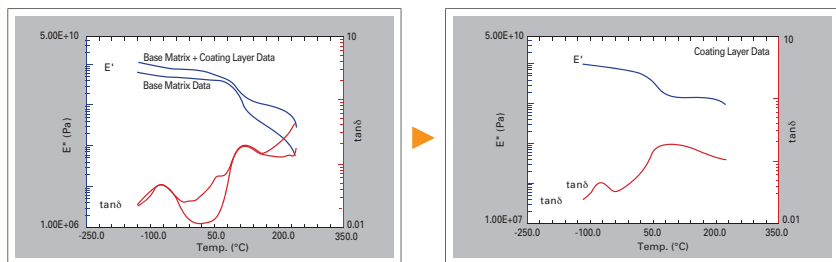
Viscoelasticity Conversion

Covers the TMA/SS measurement data to dynamic mechanical analysis data and calculate the viscoelasticity properties.



Composition Calculation

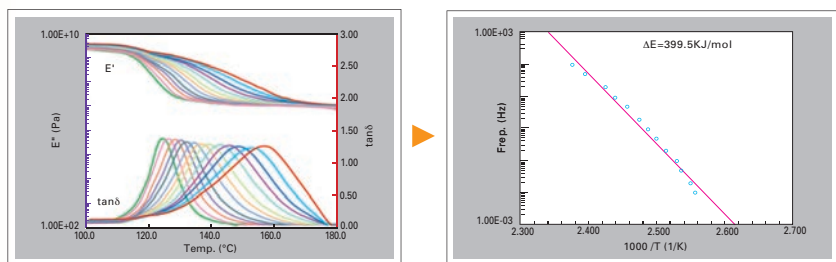
Calculates the viscoelastic properties of a coating layer from the results of a substrate with coating and a substrate without coating.



Activation Energy

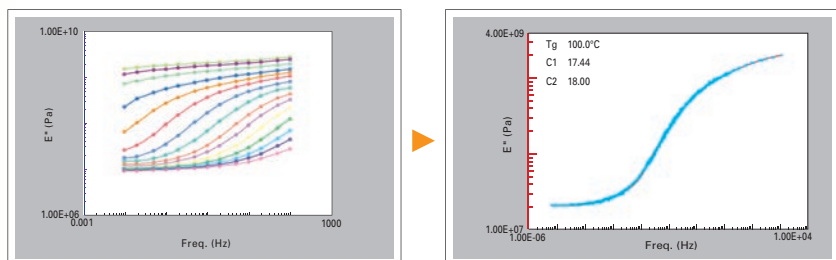
DMS

Calculates the apparent activation energy from temperature and frequency dispersion measurement results.



Master Curve

Generates the master curves using the time-temperature superposition principle for the estimation of mechanical properties at very high or very low frequencies.



Highway TA

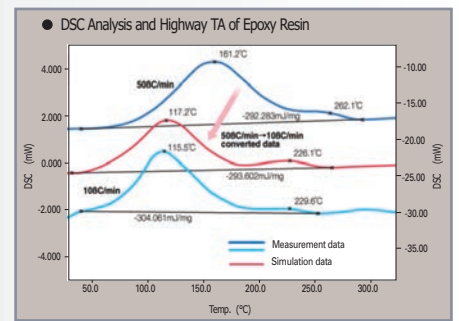
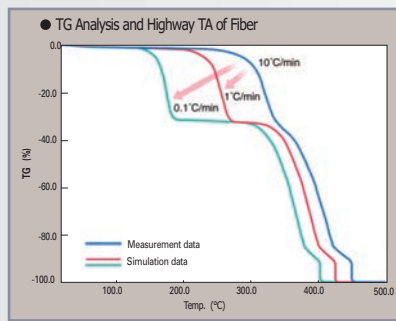
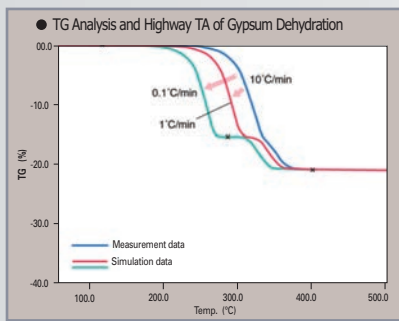
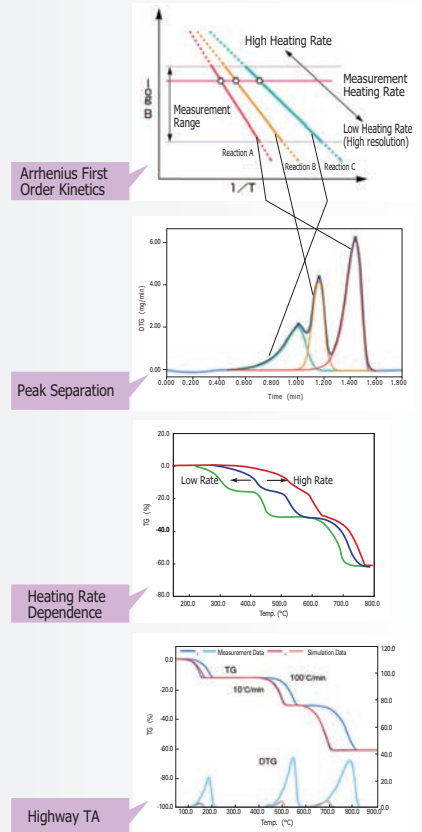
EXSTAR series of Thermal Analyzers

The Highway software improves quantitative compositional analysis through sophisticated mathematical algorithms (Peak/curve separation and Arrhenius first order kinetics) to simulate the measurement under different scan rate and to better separate the overlapping measured curve such as weight loss events. Samples can be analyzed at normal DSC and TGA heating rates, i.e. 20°C, and with the use of Highway software, the DSC and TGA data can be transposed to very slow (0.001°C/min) heating rates and very fast (100,000°C/min) heating rates. This patented technology greatly improves the prediction of reactions under different heating rates and the separation of overlapping weight loss events. (USA patent: 6210035, 6146012)

Typical Applications of the Highway TA
 Reduced measurement time for quality control. Data can be obtained with fast heating rates to save measurement time. The quality and resolution of the results is as good as if measured with low rates.

Research and Development Applications
 Highway TA has been proven to provide an accurate prediction of the transitions which would otherwise have had to be measured with low heating rates. It is also useful for:

- Calculation of the activation energy value by the comparison of the calculated and measured data.
- Separation of TG and DSC peaks (by different activation reaction energies)
- Proven to get results, one can't obtain by other technologies



Controlled Rate Thermal Analysis (CRTA)

Principle of Controlled Rate Thermal Analysis

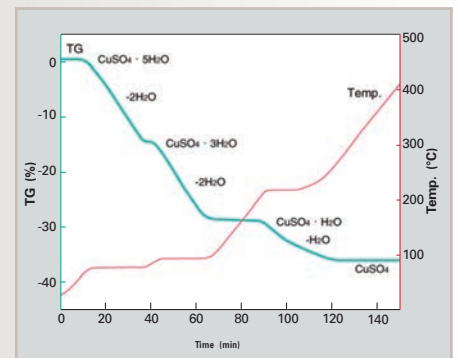
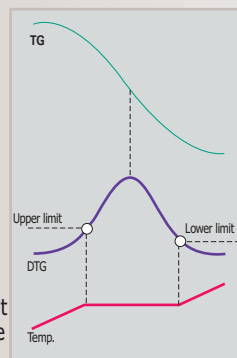
CRTA is a measurement method which automatically controls the heating rate according to the signal change of thermal analysis module. The parameters can be chosen by the operator.

1. Auto Stepwise For Better Step Separation

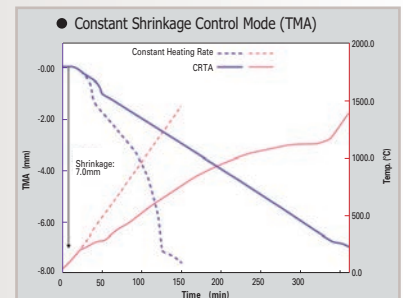
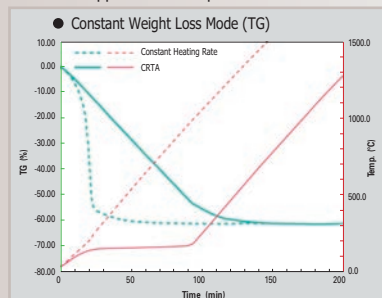
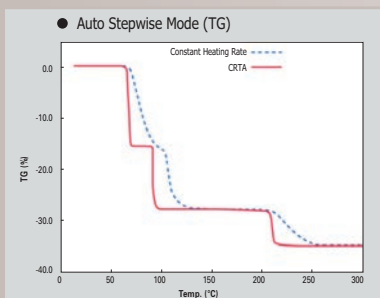
Stating threshold > Exit threshold
 Once the reaction rate of the sample reaches the starting threshold set by the operator, the heating rate automatically changes to isothermal conditions. Heating continues when the reaction rate reaches the exit threshold.

2. Constant Reaction Rate

Stating threshold = Exit threshold
 With this measurement mode, the heating rate is controlled in a way that the signal change is linear. The speed is user selectable. The result is the necessary temperature profile to achieve this linear reaction rate.



Application Examples of CRTA



SII



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