THE DISCOVERY SERIES

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DISCOVER the New Standard in Thermal Analysis Technology

DISCOVER A NEW DESIGN

The Discovery DSC represents the latest innovation from TA Instruments. Building on the Tzero® technology first pioneered in our Q Series™ instruments, the Discovery DSC introduces our innovative Diffusion-Bonded Sensor technology. This technology represents the future of temperature and heat flow measurements. The Discovery DSC provides unmatched precision, accuracy, industry-leading sensitivity and resolution.

The result is a Differential Scanning Calorimeter which improves every aspect of DSC performance…

THE NEW DISCOVERY DSC


·DISCOVERY·
series

DISCOVER BETTER PERFORMANCE FROM BETTER TECHNOLOGY

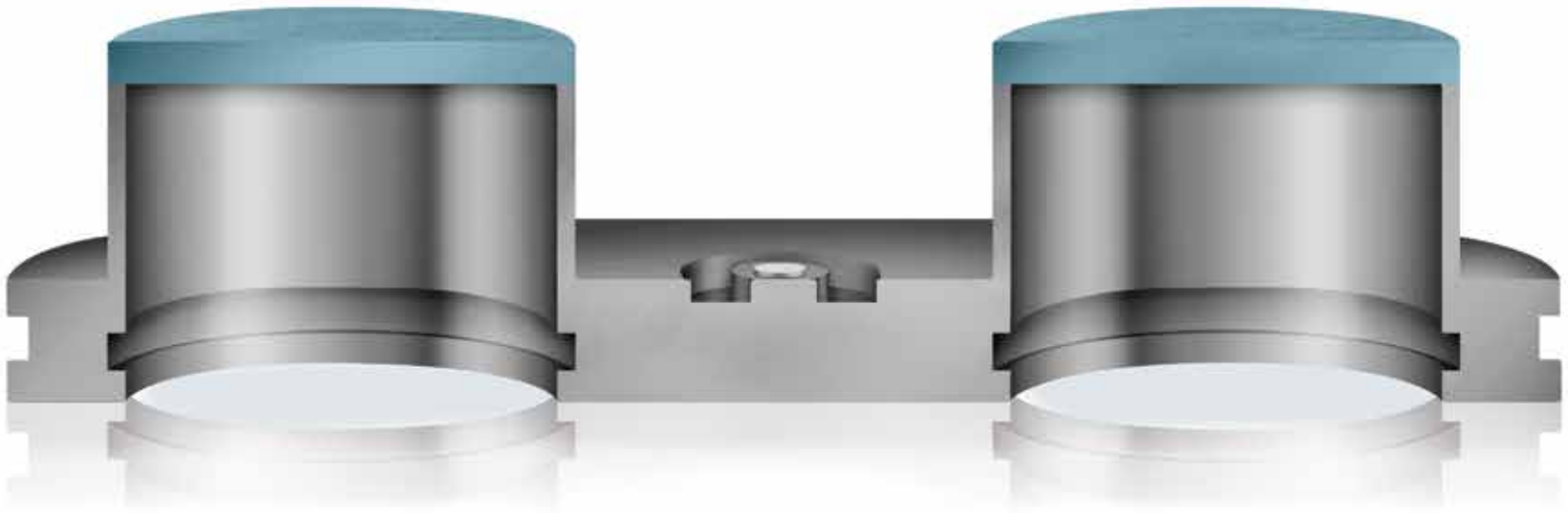
The foundation of the Discovery DSC is **Tzero® technology**, invented by TA Instruments. Tzero is a rigorous, rational, and correct method for quantitative heat flow measurement. Conventional DSC instruments treat sample-side and reference-side cell properties as identical and rely on general calibration factors or baseline subtraction. Tzero technology employs direct measurement of asymmetric cell characteristics and real-time calculation of sample heat flow in a manner independent of heating rate, sample type, or transitions. Tzero technology dramatically improves baseline performance, leading to the flattest, most reproducible baselines and the highest combination of sensitivity and resolution. Tzero is a proprietary and patented* technology from TA Instruments.

The Discovery DSC builds on Tzero technology by introducing all new designs and production methods to further improve measurement quality. The result is unmatched precision, repeatability, and accuracy of heat flow and temperature measurements, while maintaining our industry-leading sensitivity and resolution. By improving every aspect of DSC performance, the **Discovery DSC delivers meaningful and measurable benefits** to the user.

*U.S. Patent No. 6,431,747; 6,488,406; 6,523,998

$$q = -\frac{\Delta T}{R_r} + \Delta T_0\left(\frac{1}{R_s} - \frac{1}{R_r}\right) + (C_r - C_s)\frac{dT_s}{dt} - C_r\frac{d\Delta T}{dt}$$

Principal Heat Flow | Thermal Resistance Imbalance | Thermal Capacitance Imbalance | Heating Rate Imbalance



Baseline

A well-designed instrument should contribute very little to the sample measurement, and the baseline is the fundamental measurement of this contribution. For a DSC baseline, the right answer is "zero," as any errors in the baseline will propagate directly to the sample data.

The Discovery DSC produces a baseline which is perfectly flat, without any post-test modification, subtraction, or manipulation. This baseline is extremely reproducible, and quantitatively correct, allowing for an unmatched degree of accuracy for subsequent enthalpy and heat capacity measurements.

This figure demonstrates the performance of the Discovery DSC baseline in linearity, repeatability and accuracy. **It should be noted that full scale of this plot is only 20 µW!**

Baselines & DSC's

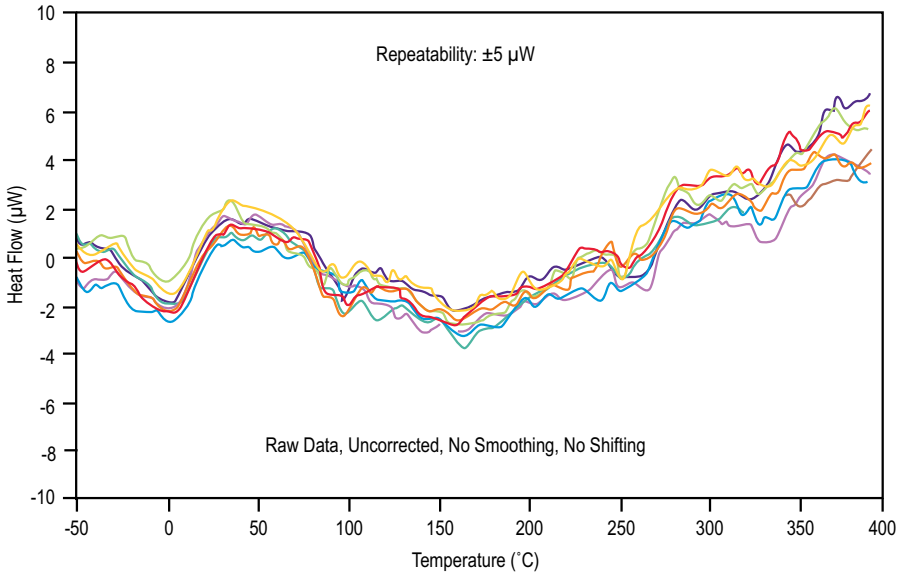
Baseline curvature results from sample-reference asymmetry which changes with temperature due to minute manufacturing variances.

A well-designed DSC will:

1. Minimize Asymmetry by Design
   The Discovery DSC features technological advances including the diffusion-bonded sensor and uniblock silver furnace to greatly enhance sample-reference symmetry.

2. Directly measure and correctly account for any remaining asymmetry
   Only Tzero® technology allows for rigorous calibration and real-time calculation of actual sample heat flow.

A well designed DSC will **never** require post-test subtraction or manipulation or calibration that is dependent on heating rate.



THE DISCOVERY DSC INCLUDES MULTIPLE INNOVATIONS DESIGNED TO INCREASE SENSITIVITY AND RESOLUTION

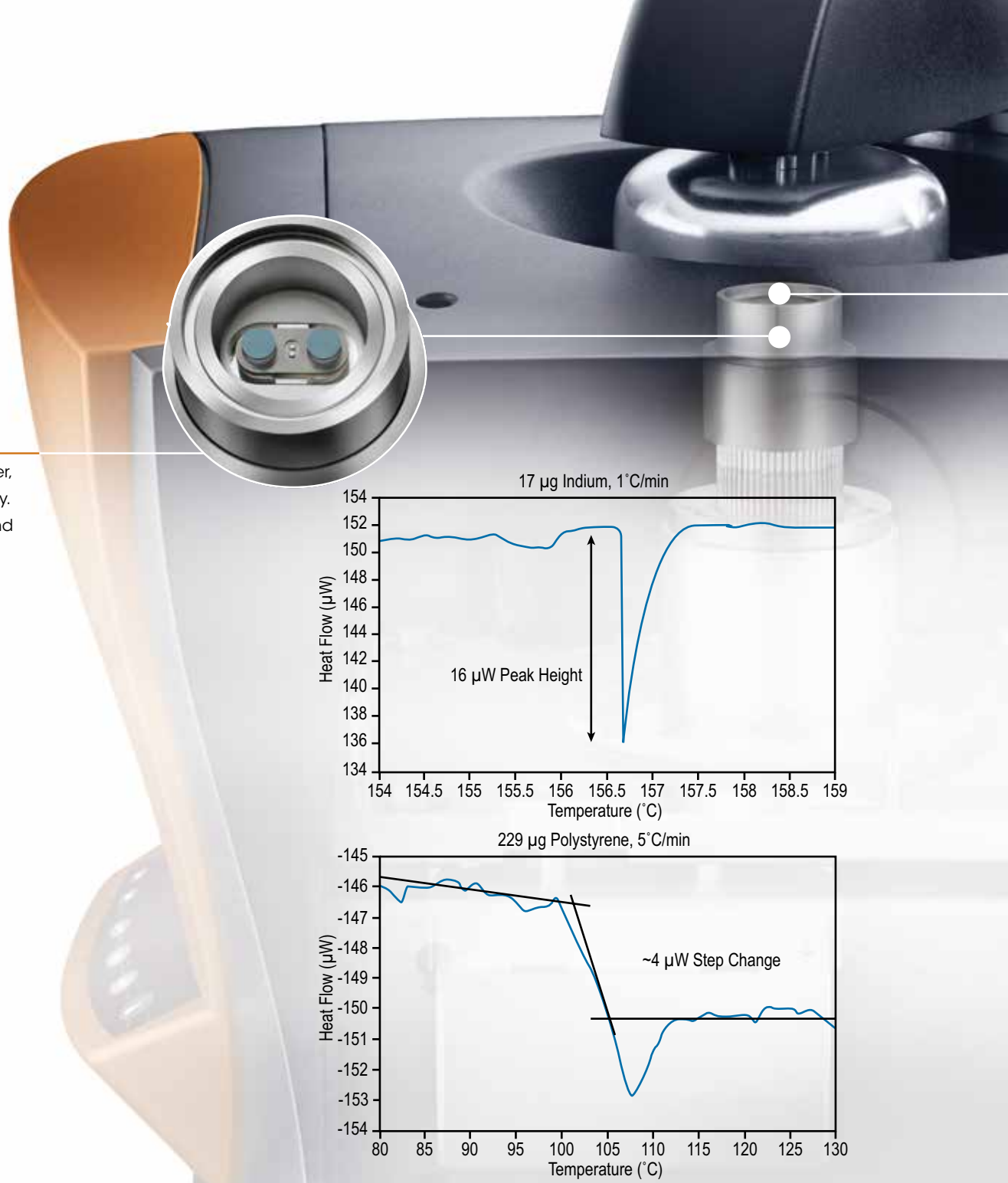
Uniblock Silver Furnace

The Uniblock furnace is precisely machined from a single block of silver, providing temperature uniformity and ensuring thermal homogeneity. The result is reduced thermal gradients, increased ruggedness and improved measurement precision.

Sensitivity & Resolution

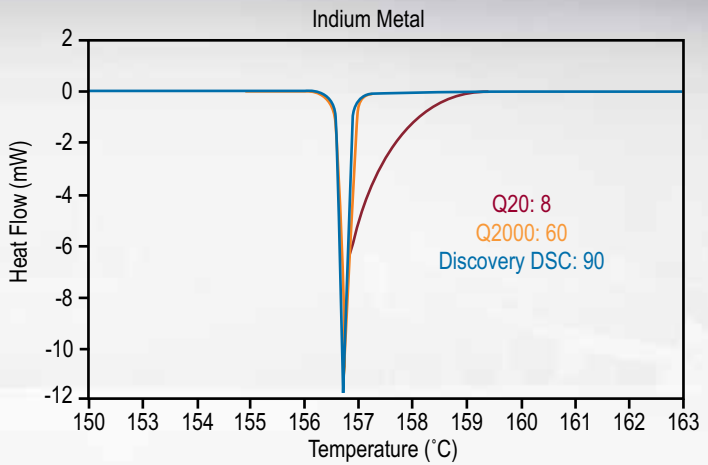
There are countless ways to measure the sensitivity of a DSC, and test methods are often exploited to promote performance under a specific set of conditions. However, experienced thermal analysts know that the best DSC provides sensitivity under all experimental conditions. The Discovery DSC delivers the highest sensitivity for a diverse range of heat flow transitions, across a wide range of experimental scanning rates. This is accomplished through the combination of transducer innovations and our patented Tzero® technology which flattens the baseline, maximizes the signal response and minimizes short-term noise. The result is the highest level of sensitivity for your materials, under any experimental condition.

The figures to the right demonstrate the high level of sensitivity inherent in the Discovery DSC, for both subtle peaks (17 µg sample of indium) and step change transitions such as the 4 µW Tg of a polystyrene sample.



Diffusion-Bonded Sensor

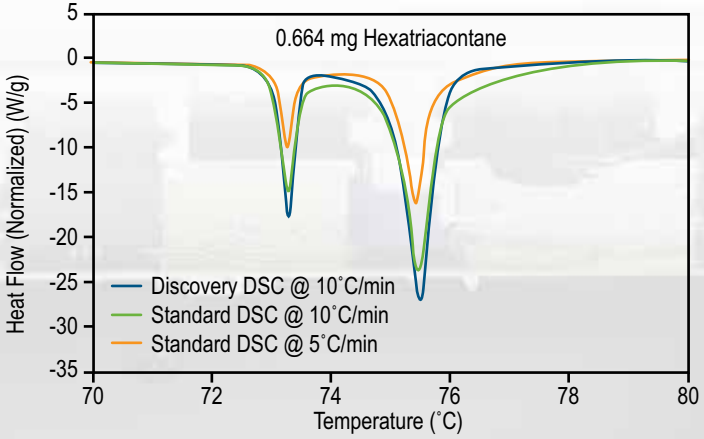
The heart of the Discovery DSC technology is the Diffusion-Bonded Sensor. To ensure highly repeatable and stable measurements, the transducer is precision-mounted on a fixed pedestal. Unlike competitive designs where sensors are allowed to move, this pedestal mounting results in a stable configuration with a well-defined heat-flow path unaffected by thermal gradients. The result is unmatched precision and repeatability of the heat flow and temperature measurements.



Resolution

The figure on the top shows the resolution performance of the Discovery DSC using the Indium Response Ratio (H/W). This performance is indicative of better resolution and gives the ability to resolve closely spaced transitions.

The figure on the bottom demonstrates a practical application of this resolution. The Discovery DSC data at 10 °C/min has better resolution, illustrated by the quicker return to baseline after the first transition, than either the 10 °C/min or 5 °C/min of the standard DSC. This means that better resolution can be achieved at a higher heating rate, also giving higher productivity.



THE DISCOVERY DSC
STABILITY, PRECISION, REPEATABILITY, ACCURACY

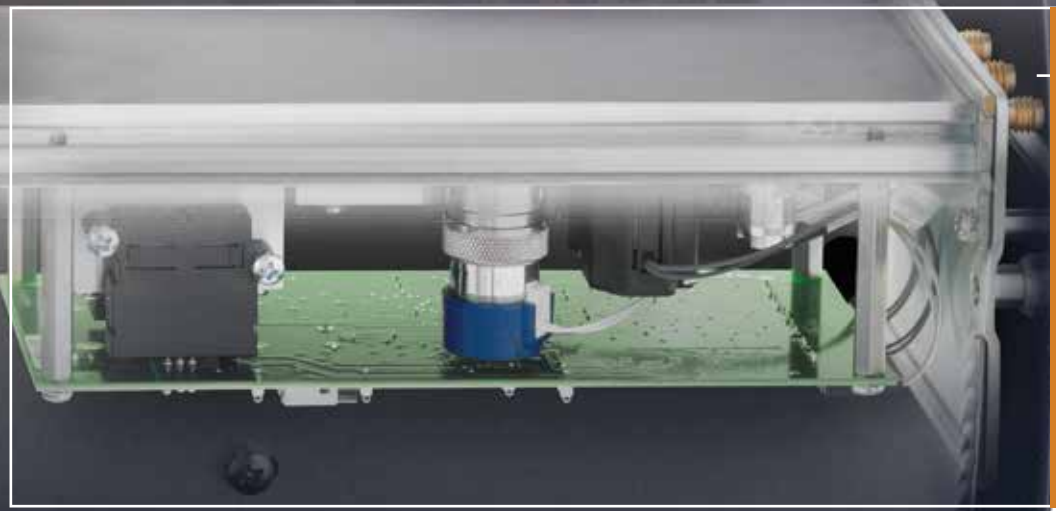
Temperature-Controlled Electronics

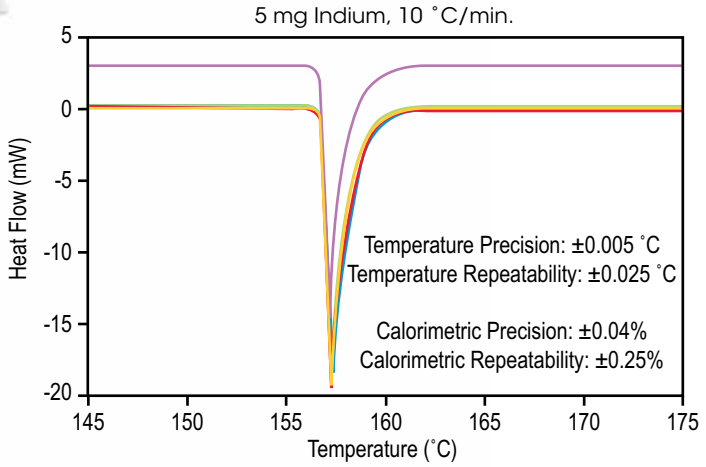
The Discovery DSC cell processes the measured signals through an insulated conduit to state-of-the-art temperature-controlled electronics, eliminating the adverse influence of temperature variation on the electronics which is commonly found in competitive technology.

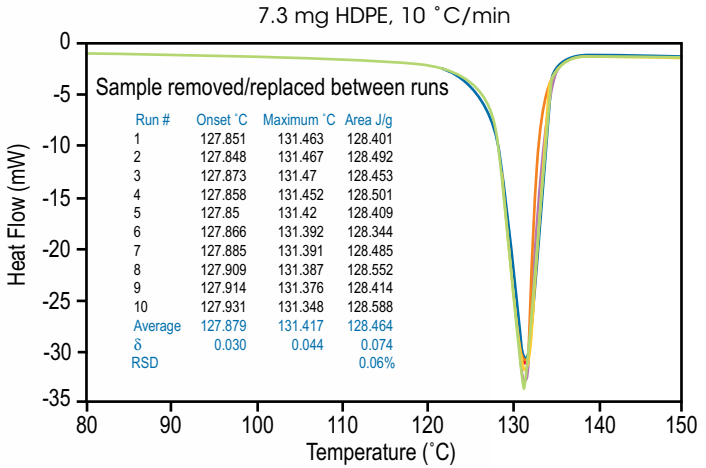
Precision and Accuracy

An instrument's performance is only as good as its repeatability, and scientists demand results with a high level of precision and accuracy. TA Instruments recognizes this need for precise data and has engineered into the Discovery DSC patented and proprietary technology which provides effortless measurement repeatability. The combination of the technical innovations results in a level of measurement precision previously unattainable.

The figures to the right demonstrate this level of measurement repeatability on both standard materials as well as real-life samples. In all cases, the sample was removed and replaced in between each run.







Run #	Onset ˚C	Maximum ˚C	Area J/g
1	127.851	131.463	128.401
2	127.848	131.467	128.492
3	127.873	131.47	128.453
4	127.858	131.452	128.501
5	127.85	131.42	128.409
6	127.866	131.392	128.344
7	127.885	131.391	128.485
8	127.909	131.387	128.552
9	127.914	131.376	128.414
10	127.931	131.348	128.588
Average	127.879	131.417	128.464
δ	0.030	0.044	0.074
RSD			0.06%

Gas-Delivery Module

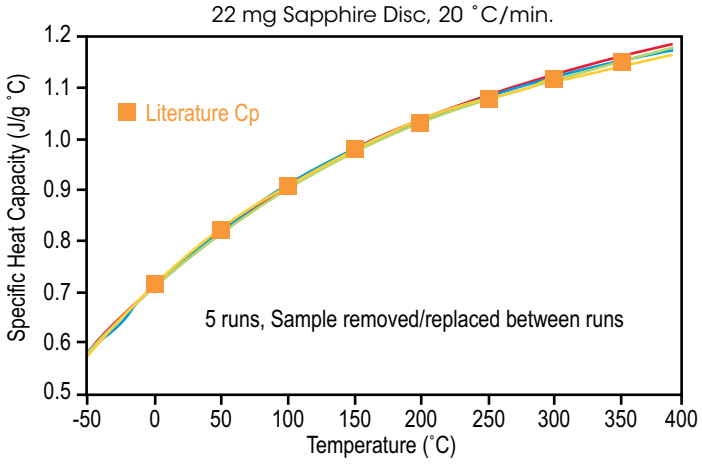
Our innovative Gas-Delivery Module is standard on the Discovery DSC. The manifold design eliminates tubing and hardware connections which are prone to leaks, ensuring a highly consistent, repeatable inert atmosphere. For experiments which require dynamic or reactive atmospheres, software-controlled gas switching is also supported.

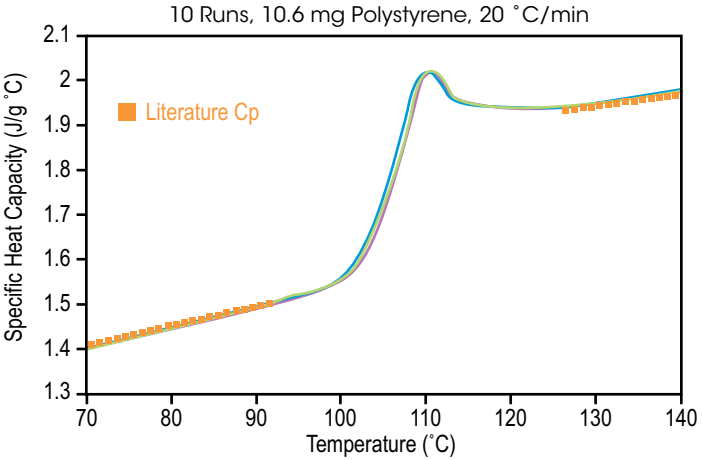
HEAT FLOW SO ACCURATE IT IS ABSOLUTE

TECHNOLOGY

Diffusion bonding of metals is accomplished by placing two metal surfaces in contact at an elevated temperature and pressure. Over time, diffusion of the metals occurs at the atomic level, producing an intimate, continuous, high-quality bond. In the Discovery DSC, chromel and constantan are diffusion-bonded to produce **the perfect thermocouple**. In the resultant transducer structure, the diffusion bond is positioned just below the sample surface, **in the perfect position**. The measurement is less sensitive to pan placement effects thereby maximizing repeatability. Unlike alternative designs which employ discrete sensor points, the Diffusion-Bonded Sensor* is a continuous thermosensitive surface, dramatically improving sensitivity of the temperature measurement while maintaining a very short time constant for excellent signal resolution.

*US Patent No. 7,470,057





Absolute Heat Flow for Absolute Heat Capacity

Competitive DSC baselines – and therefore heat flow values – drift in absolute magnitude from one run to another. That is why the standard method for heat capacity measurements requires three sequential runs for every experiment: an empty DSC cell, a calibration to sapphire, and the sample of interest. Alternatively, step-iso experiments can be performed, but these are equally time-consuming and only provide results at specific temperature intervals. Unlike competitive designs, the diffusion bonded transducer of the Discovery DSC produces a heat flow measurement that is absolutely precise and accurate on every run, under all conditions. The result is **heat flow so accurate, on every run, that it is always quantitative heat capacity**, without any additional calibrations, subtractions, or corrections.

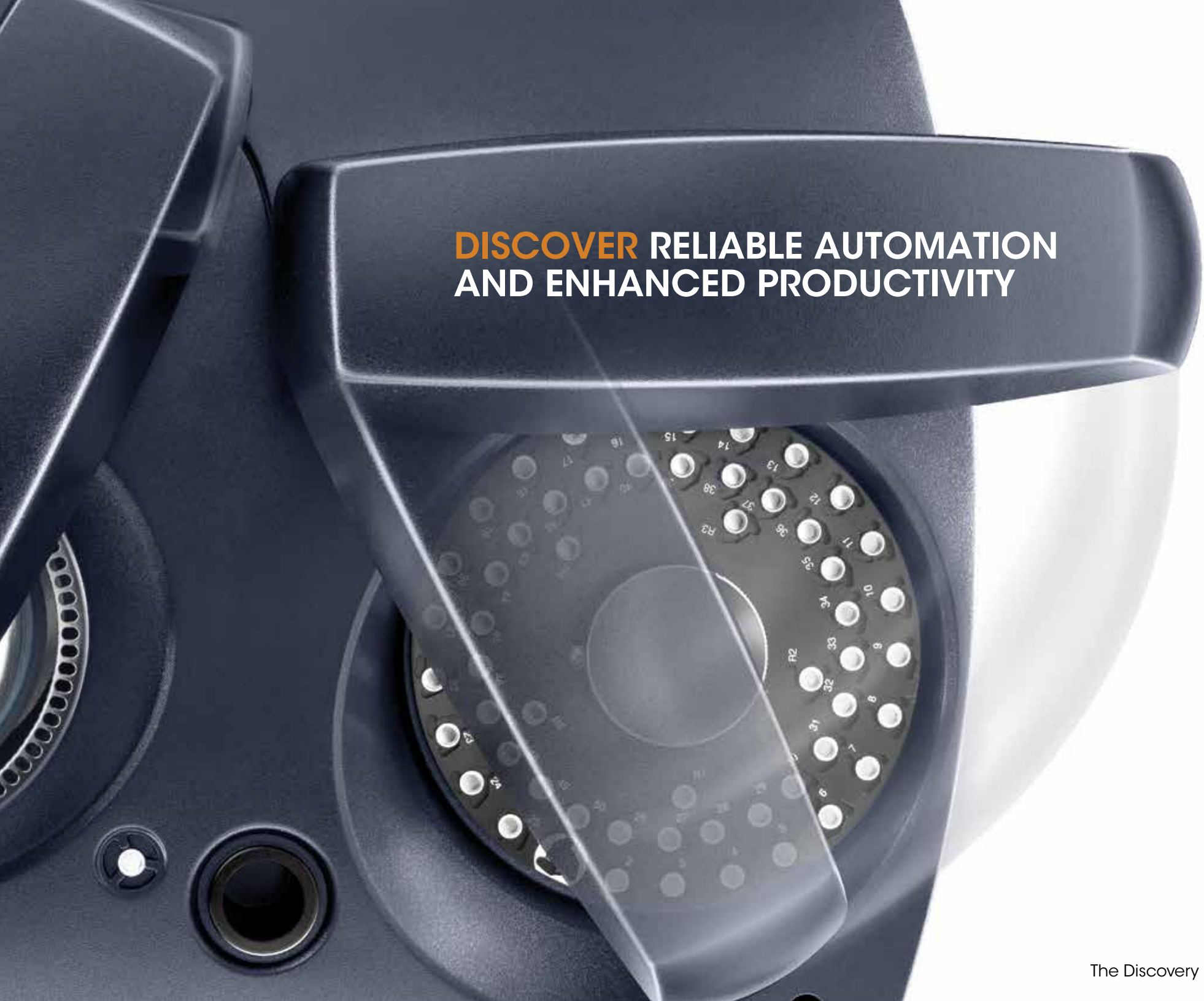
Heat capacity is the intrinsic property of a material which gives rise to heat exchange, and is a highly sensitive indicator of a material's molecular structure and mobility, revealing important insights about crystallinity, chemical bond structure, and volumetric packing. This Discovery DSC provides this information for every sample, on every run.

Reliable Automation

TA's proprietary autosampler technology* is a standard feature on every Discovery DSC. Field-proven in thousands of laboratories, the reliable and easy-to-use autosampler enables customers to generate superior DSC data around the clock. Powerful new TRIOS software makes it easier than ever for users to manage the sample queue. The re-designed Discovery DSC auto-lid provides consistent and repeatable cell closure, providing effective thermal isolation for the sensor, and further improving measurement repeatability.

The new TRIOS software provides scheduled and automated performance verification and calibration. This allows the instrument to perform these critical tasks on a regular basis and during off-peak hours, guaranteeing optimal data accuracy and laboratory productivity.

*U.S. Patent No. 6,644,136; 6,652,015; 6,760,679; 6,823,278



DISCOVER RELIABLE AUTOMATION AND ENHANCED PRODUCTIVITY

accessories

Tzero® Pans

TA Instruments offers a wide selection of sample pans to meet standard and specialized applications. The Tzero Series of high-performance pans and lids are designed to **maximize pan flatness and sample contact**. Coupled with the unparalleled flatness and uniformity of the Discovery DSC sensor, the Tzero pans and lids provide the **most direct, uniform heat flow path from the sample to the sensor.** These pans are tolerant of many sample forms and are designed with lids that conform to the top of irregular specimens, efficiently transferring heat to and from the entire sample. Competitors' pan designs that have non-flat bases are unable to achieve appropriate thermal contact with solid specimens. Fabricated using advanced technology and to extremely tight tooling specifications, the Tzero pans offer significant improvements in resolution and repeatability over conventional pan designs and competitors' technology.

Tzero® DSC Sample Encapsulation Press

A key contributor to the quality of DSC results is the sample preparation. The Tzero press takes sample encapsulation to a higher level of performance and convenience in conventional and hermetic sealing of a wide variety of materials. The press kit includes die sets (4) for the new Tzero aluminum and Tzero hermetic pans & lids and also for our upgraded standard and hermetic pans & lids. Optional die sets are available for hi-volume DSC pans and Discovery TGA sealed pans. The die sets are magnetically attached with no tools or user adjustments required. In addition, each die set is color-coded to the box containing the compatible Tzero or standard aluminum or hermetic pans and lids.

Photocalorimeter

The Photocalorimeter Accessory (PCA) permits characterization of photocuring materials between -50 and 250°C. UV/Visible light (320-500 nm) from a 200 W high pressure mercury source is transmitted to the sample chamber via an extended range, dual-quartz light guide with neutral density or band pass filters. Tzero® technology permits direct and accurate measurement of light intensity at both the sample and reference positions without the need for an external radiometer. It also provides for simultaneous measurement of two samples.

Optical Accessory Kit

The Optical Accessory Kit provides an interface for simultaneous calorimetric and spectroscopic measurements using a **Near-IR** or **Raman spectrometer** probe. Such measurements can provide information on the chemical or structural changes that are occurring within a material that is complementary to the heat flow data collected by the DSC. A specially-designed cell lid assembly allows for direct observation of the sample by the external optical probe while maintaining high-quality calorimetric performance. This flexible system can be configured to work with many optical systems through the use of an appropriate probe adapter supplied by the spectrometer vendor.

accessories

Refrigerated Cooling Systems (RCS90 and RCS40)

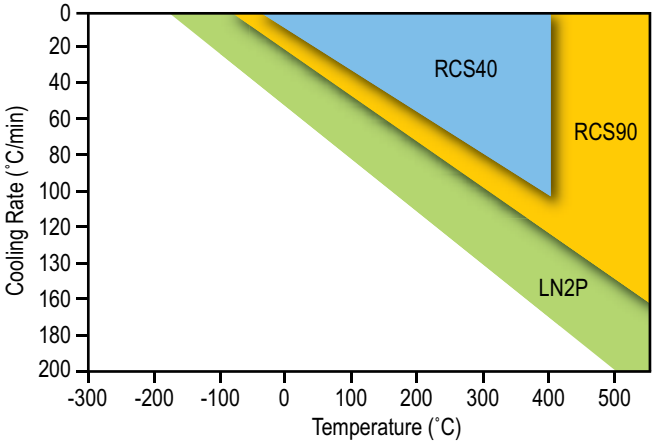
The RCS is frequently selected as the preferred cooling device by thermal analysts for trouble-free, unattended DSC and MDSC® operation over a broad temperature range. Because it is a sealed system requiring only electrical power, the RCS has advantages for operation in areas where other refrigerants are difficult or expensive to obtain. TA Instruments offers two complementary models: the RCS90 and the RCS40. Both use the same cooling head, which fits snugly over the Discovery DSC Cell and completely eliminates frosting issues typical in competitive designs. Both controlled and ballistic cooling are achievable.

RCS90

The RCS90 employs a two-stage refrigeration system, which permits convenient DSC/MDSC operation over the temperature range from -90 to 550°C. Typical RCS90 controlled cooling rates are detailed in the table on the following page. Ballistic cooling from 500°C to ambient is achieved in about 7 minutes.

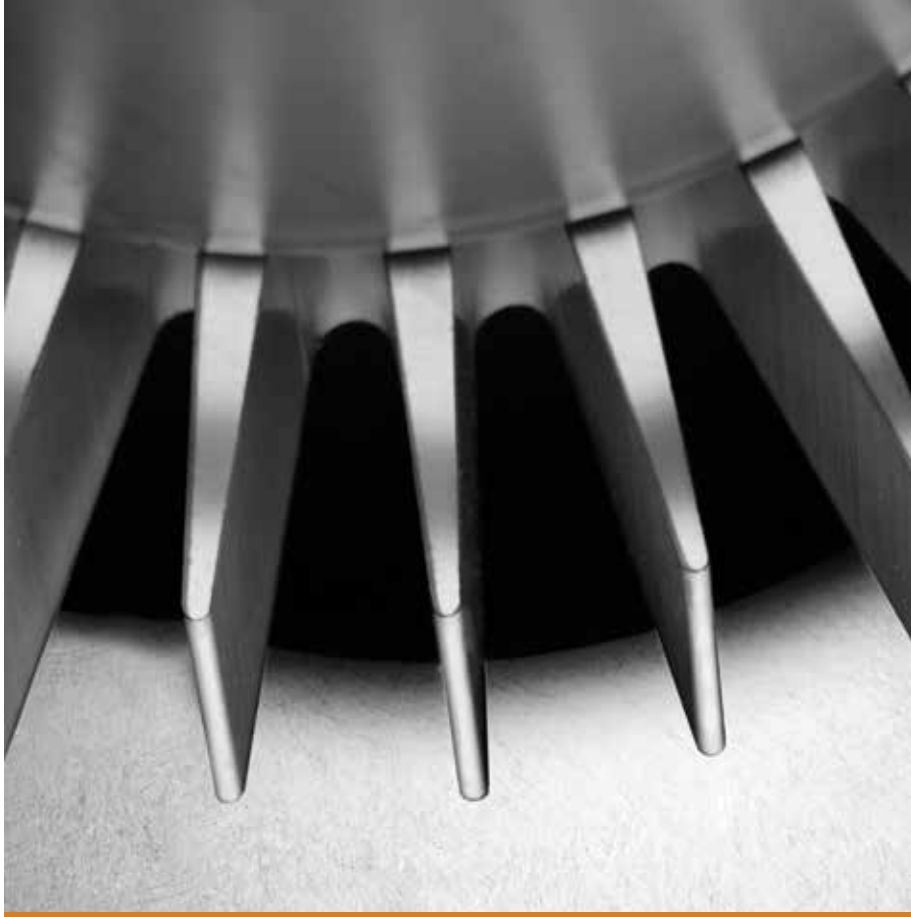
RCS40

The RCS40 employs a single-stage refrigeration system, which permits convenient DSC and MDSC® operation over the temperature range from -40°C to 400°C. Typical RCS40 controlled cooling rates are detailed in the table on the following page. Ballistic cooling from 400°C to ambient is achieved in about 7 minutes.



Discovery Liquid Nitrogen Pump Accessory (LN2P)

The LN2P provides the highest performance and greatest flexibility in cooling for the Discovery DSC. It facilitates the lowest operational temperature (to -180 °C), greatest cooling rate capacity (to 140 °C/min), fastest sub-ambient equilibration times, and an upper temperature limit of 550 °C. Operating at ambient pressure, the LN2P uses liquid nitrogen efficiently, thus reducing operating costs. It includes a 50-liter Dewar on wheels with self-filling (auto-fill) capability which allows the LN2P to be automatically refilled from a larger liquid nitrogen source, even during a DSC experiment, for continuous DSC operation with no disruption to the measured data.



Finned Air Cooling System

The Finned Air Cooling System (FACS) is an innovative cooling accessory that offers a cost-effective alternative to the RCS or LN2P cooling systems. The FACS can be used for controlled cooling experiments, thermal cycling studies, and to improve sample turnaround time. Stable baselines and linear heating and cooling rates can be achieved between ambient and 725°C.

specifications

Technical Specifications

Specification	Value
Temperature Range	-180 °C – 725 °C
Temperature Accuracy	±0.025 °C
Temperature Precision	±0.005 °C
Enthalpy Precision	±0.04 %
Heat Flow Noise (rms)	≤0.08 µW
Baseline Linearity (-50 °C – 400 °C)	≤5 µW
Baseline Accuracy (-50 °C – 400 °C)	±20 µW
Baseline Repeatability (-50 °C – 400 °C)	±5 µW
Measurement Time Constant	≤0.8 s
Indium Response Ratio	≥90
Direct Cp Accuracy (-50 °C – 400 °C)	≤3 %
Direct Cp Precision (-50 °C – 400 °C)	≤1%
Direct Cp Repeatability (-50 °C – 400 °C)	≤1%

Instrument Features

Technologies	
Advanced Tzero® Technology	●
Advanced Modulated DSC®	●
Direct Cp Measurement	●
User Replaceable Cell	●
50-Position Autosampler	●
Automated & Scheduled Calibration/Verification	●
Autolid	●
Dual Input Gas-Delivery Module	●
Color Touchscreen User Interface	●
Full Range of Cooling Accessories (RCS90, RCS40, LN2P, FACS, QCA)	○
Photocalorimeter	○
Optical Accessory Kit (Raman, NIR)	○

Compatible with Tzero® DSC Sample Encapsulation Press

● Included

○ Optional

DISCOVER POWERFUL THERMOGRAVIMETRIC TECHNOLOGY

The Discovery TGA features our industry-leading thermobalance, innovative IR-heated furnace, patented* HiRes TGA™, and an autosampler unmatched in flexibility and reliability. The new Gas-Delivery Module provides gas switching, and blending capabilities for the ultimate in atmospheric control. The Discovery User Interface simplifies interaction with the instrument, and provides for effortless control and monitoring of TGA experiments. The result is the ultimate in sensitivity, accuracy, resolution and temperature control…

THE NEW DISCOVERY TGA

*U.S. Patent No. 5,165,792 Canadian Patent No. 2,051,578 European Patent No. 0494492


DISCOVERY
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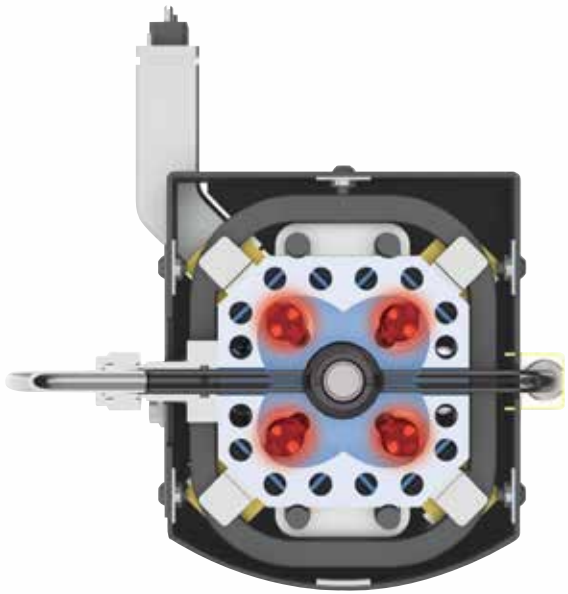
THE DISCOVERY TGA INCLUDES MULTIPLE INNOVATIONS DESIGNED TO INCREASE PERFORMANCE

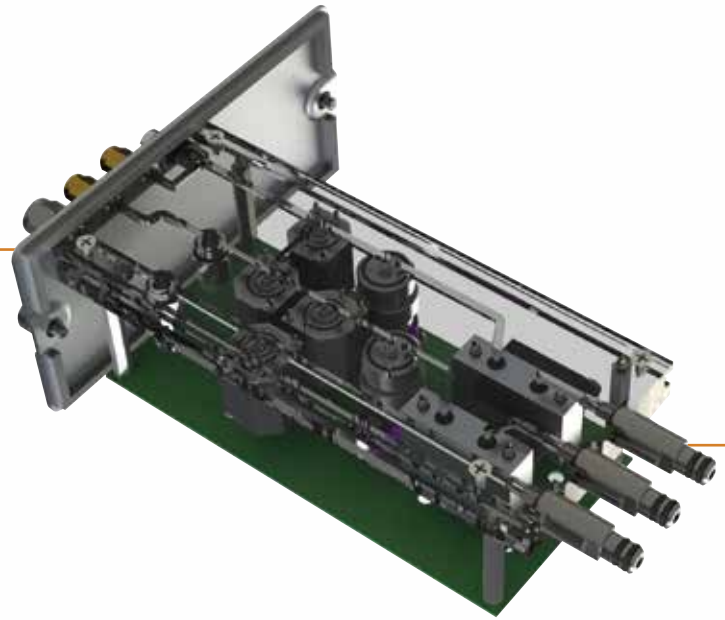


IR Furnace

Our unique furnace technology employs infrared heating providing the widest range of temperature and heating rates available. This patented design utilizes four symmetrically placed halogen lamps with gold elliptical reflectors surrounding a SiC sample enclosure. IR radiation from the halogen lamps results in radiative heating of the SiC. Active water-cooling of the surrounding furnace body provides an efficient heat-sink and facilitates precise temperature and rate control. The Discovery TGA can be heated from 0.1 to 500 °C/min in linear control, or over 1600 °C/min in ballistic heating over the range ambient to 1200 °C. An optional heated outlet is available for evolved gas analysis techniques such as TGA-FTIR and TGA-MS.

Gas-Delivery Module

The Gas-Delivery Module (GDM) is standard on the Discovery TGA. The manifold design eliminates tubing and hardware connections which are prone to leaks, ensuring a highly consistent, repeatable atmosphere. The standard GDM permits software-controlled switching between two gases. For experiments which require dynamic or reactive atmospheres, the optional 4-Gas GDM supports controlled gas switching between four gases and controlled blending between two gases. Gas flow rates are automatically controlled and recorded to ensure confidence in the quality and repeatability of experimental results.

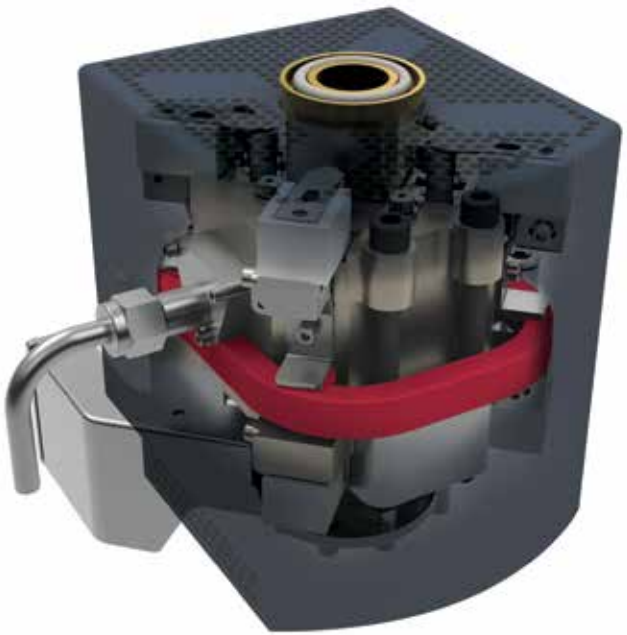


Pan-punching

A special auto-sampler feature is the patented pan-punching mechanism designed to reliably open sealed aluminum pans used to protect atmosphere sensitive samples.

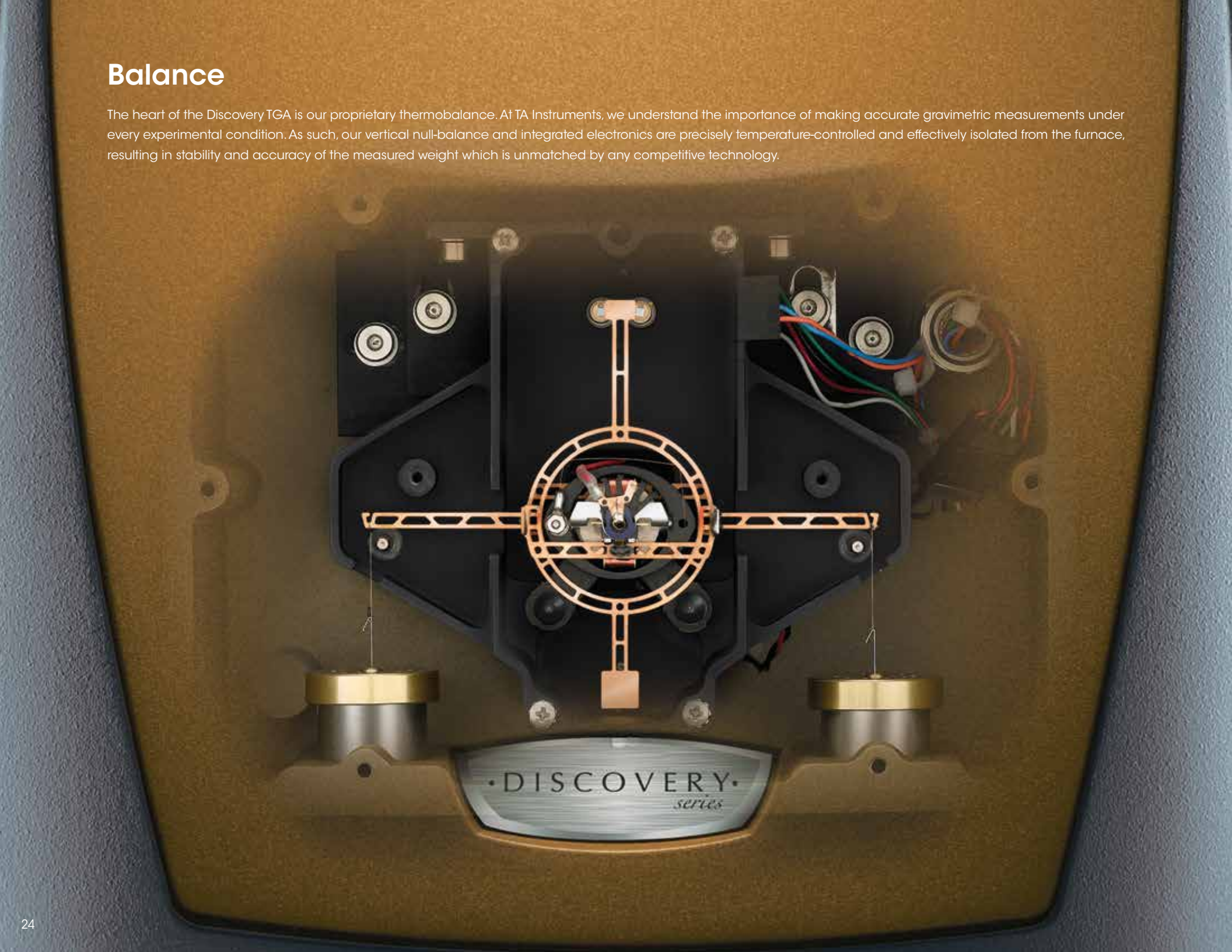
Integrated Electromagnet

The Discovery TGA furnace features an integrated electromagnet designed for automated verification and temperature calibration using Curie point standards. Unlike TGA designs that require a physical magnet to be manually positioned above or below the furnace, unattended calibrations can be performed according to ASTM E1582. Combined with automatic and scheduled calibrations through the TRIOS software, this feature ensures the system is always in optimal operating conditions and minimizes operator time dedicated to routine operations.



Balance

The heart of the Discovery TGA is our proprietary thermobalance. At TA Instruments, we understand the importance of making accurate gravimetric measurements under every experimental condition. As such, our vertical null-balance and integrated electronics are precisely temperature-controlled and effectively isolated from the furnace, resulting in stability and accuracy of the measured weight which is unmatched by any competitive technology.



Weight Measurement

An analytical balance is designed to provide accurate measurement of weight, usually at ambient temperature. A thermobalance extends this measurement, and provides the weight measurement under dynamic conditions of temperature and atmosphere. A good thermobalance should be able to provide accuracy under all achievable instrumental conditions, and the TGA baseline is the fundamental measurement of this accuracy. After taring, the theoretical value for the baseline is zero, and this value should be obtained at every temperature, under all conditions.

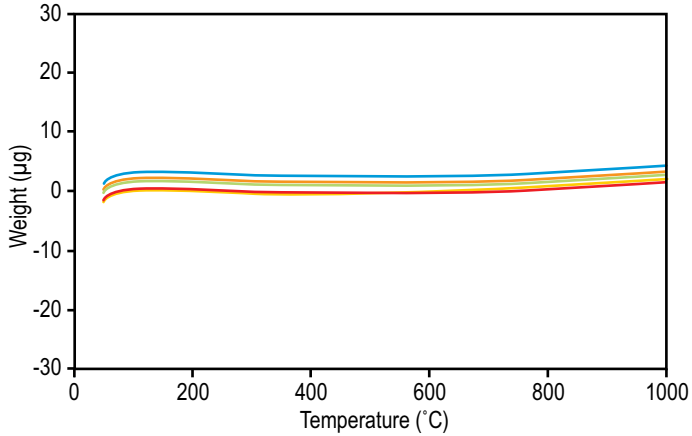
Some competitive technologies employ good balances, but their performance begins to falter once the furnace is activated. Complicating effects of magnetic fields, buoyancy and inferior design can cause instrumental artifacts such as offset, drift and noise, which can compromise accurate TGA performance. The only solution for these effects is to constantly perform baseline or background subtractions, which reduces lab productivity and can potentially introduce new sources of error into the resultant measurement.

The Discovery TGA incorporates unique and proprietary technology to provide the most accurate measurement of weight under all experimental conditions. This performance can be quantified by examination of the Discovery TGA baseline, as shown in the figure on the top. The theoretical value for the baseline is zero at all conditions; any deviation from this value represents systematic error. The Discovery TGA delivers a flat, fundamentally accurate baseline free from complicating artifacts such as curvature and slope often seen in competitive technology. Baseline subtractions are never required. This performance is also highly repeatable.

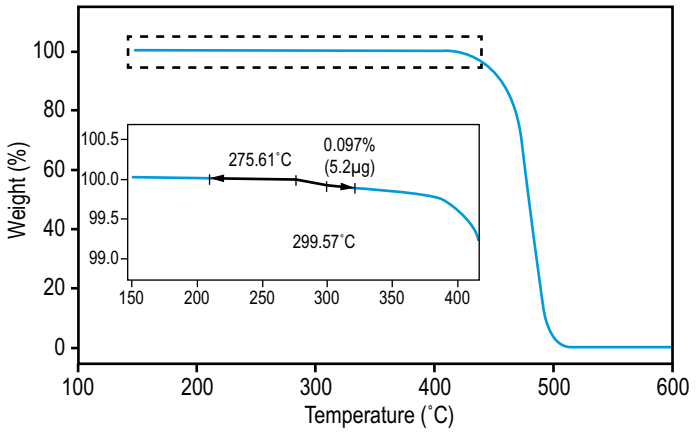
High Sensitivity for Small Weight Loss

The baseline stability of the Discovery TGA allows for the ultimate in high-sensitivity measurements. The data in this figure shows the analysis of the decomposition of a 5.4 mg sample of high-density polyethylene (HDPE) doped with 10 µg of PVC. The inset view shows an expanded scale, where the first step of the PVC decomposition is clearly detected and quantified, even though the corresponding weight change is less than 6 micrograms!

Baseline Accuracy



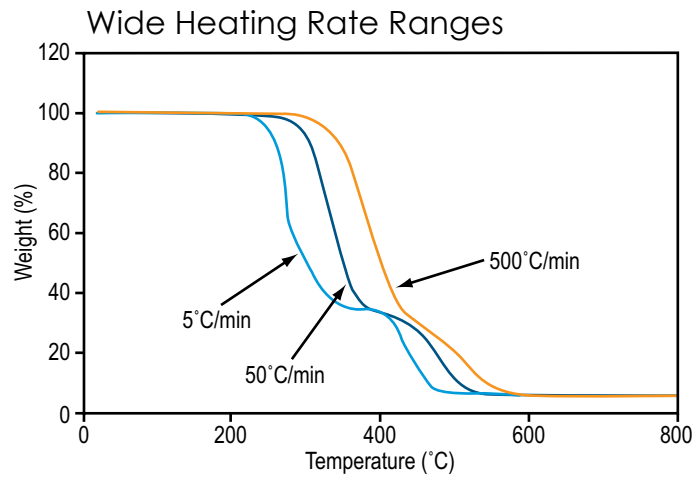
High Sensitivity for Small Weight Loss

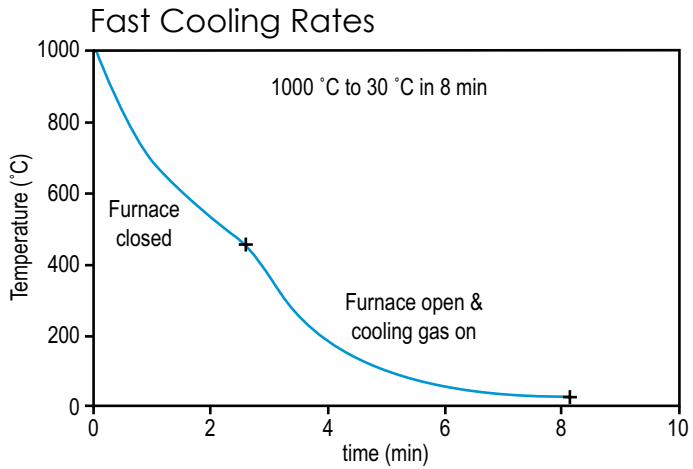


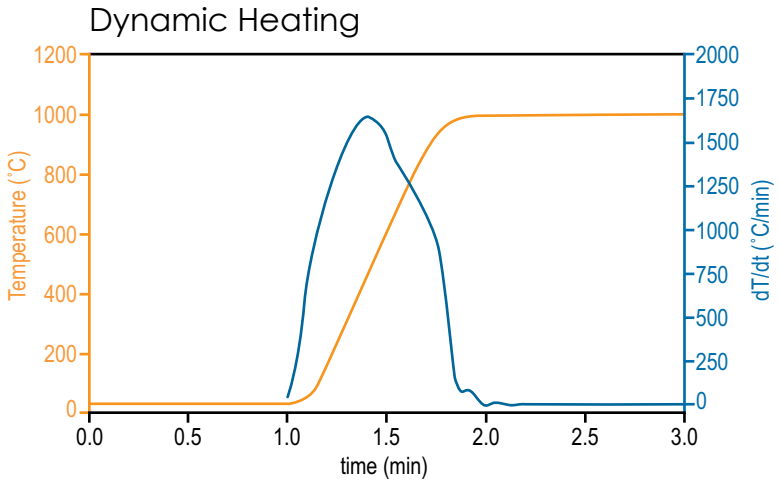
Wide Heating and Cooling Rate Ranges Improve Productivity

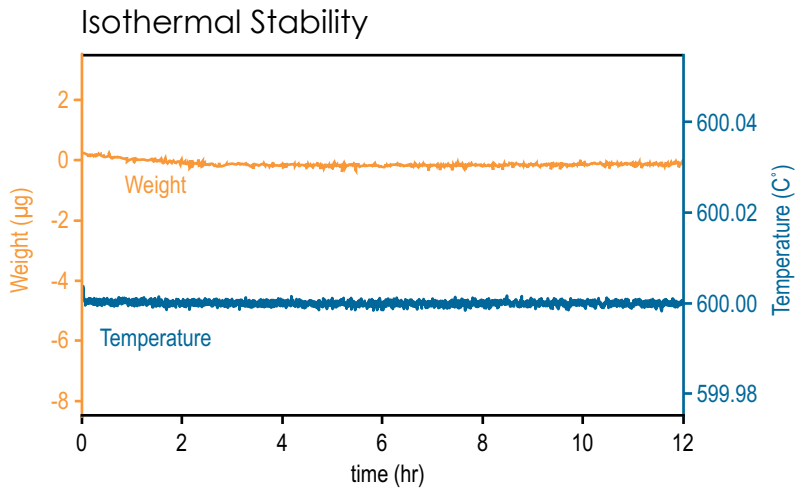
The IR-Furnace of the Discovery TGA is able to control over a wide range of linear rates, while maintaining quantitative accuracy in weight loss. The data in this figure show the analysis of the two-step decomposition of a polymer sample analyzed at three different heating rates. Even at the fastest rate of 500 °C/min, the quantitative weight loss measurement is consistent. This allows for a 10x increase in productivity by running samples at elevated rates without any loss of accuracy.

Net sample throughput is not only a function of the heating rate, but is also dependent on the time necessary to cool the furnace back down to room temperature to start the next test. As seen in the temperature profile below, the Discovery TGA's low thermal mass IR-furnace can cool from 1000 °C to room temperature in 8 minutes, far faster than resistive wound furnaces.









Temperature Control & Accuracy

Thermogravimetric experiments require precise, repeatable, accurate temperature control. The Discovery TGA features our proprietary IR-heated furnace which delivers unmatched control and stability in ballistic, controlled-heating, and isothermal experiments. The figure on the top illustrates the rapid response and equilibration of the Discovery TGA. The commanded 1000 °C temperature jump is precisely achieved in less than 60 seconds, peaking at a ballistic rate of over 1600 °C/min.

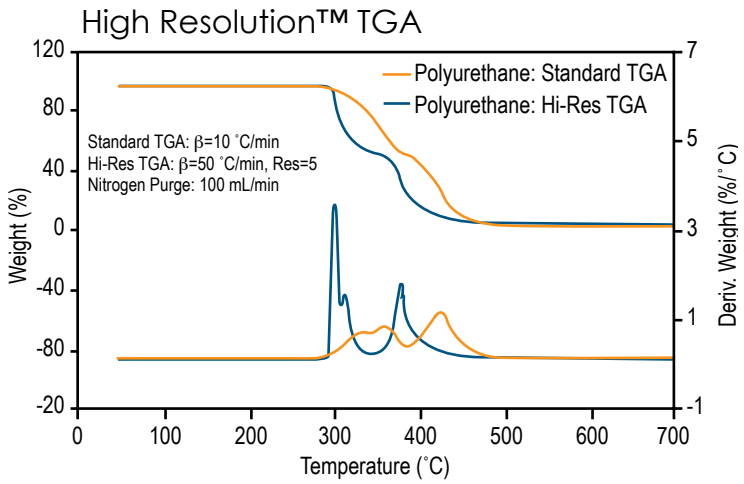
Isothermal control of temperature is critical for weight measurement stability. The figure on the bottom shows the temperature and corresponding weight signals for an isothermal baseline measured over 12 hours. The temperature deviates less than 0.005 °C, which contributes to weight stability within 0.5 µg over the duration of the experiment.

This precise temperature control and long-term stability is coupled with unattended calibration using the integrated electromagnet for Curie point calibration according to ASTM E1582. The result is the most accurate, precise, reliable temperature measurement available on a TGA.

applications

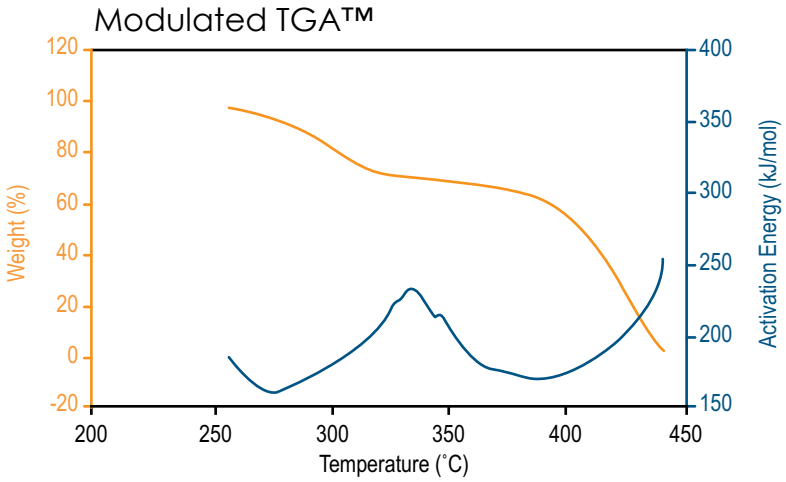
High Resolution™ TGA

This figure compares the decomposition profile plots of a polyurethane material by standard and by Hi-Res™ TGA. The superior resolution provided by the Hi-Res™ technique is clearly evident in both the TGA and first derivative (DTG) signals. The latter signal is especially useful in defining the onset and end set of the individual weight loss segments, as well as indicating subtle events that provide a "fingerprint" of the sample.



Modulated TGA™

The figure to the right shows data from an MTGA™ kinetic study of the effect of temperature on the decomposition of 60 % ethylene vinyl acetate (EVA) in a single analysis. The plot quantitatively shows the EVA decomposition profile and changes in activation energy as functions of temperature. The data supports a dual-step decomposition mechanism. MTGA can also monitor activation energy as a function of conversion, which indicates the mechanism involved.



Autosampler

The Discovery TGA features our reliable 25-position autosampler. Offering the ultimate in flexibility, the autosampler supports multiple pan types and includes our patented pan-punching mechanism to open sealed aluminum pans just prior to analysis. This allows for effective isolation of air-sensitive or volatile samples while maintaining the productivity of the autosampler. The new TRIOS software uses the integrated electromagnet to provide **scheduled and automated** temperature verification and calibration. This allows the instrument to perform these critical tasks on a regular basis and during off-peak hours, guaranteeing optimal data accuracy and laboratory productivity.

evolved gas analysis

Evolved gas analysis involves the qualitative investigation of the evolved gas products from a TGA experiment. These products are generally the result of decomposition, but can also evolve from desorption, evaporation or chemical reactions. Evolved gas analysis is typically performed by interfacing a mass spectrometer (MS) or Fourier transform infrared spectrometer (FTIR) to the exit port of the TGA furnace. Through the use of a heated transfer line, the evolved gas stream is delivered to the MS or FTIR instrument, and the compositional analysis is performed in real time. TA Instruments offers a 300 amu bench-top, quadrapole mass spectrometer with a heated capillary interface, and TGA module-specific interface kits for the Discovery TGA. A variety of FTIR suppliers provide gas cells and interfaces.

The Discovery TGA is the ideal platform for evolved gas analysis studies. A horizontal purge stream over the sample and a short path to the exit port eliminates dead volume in the furnace, thereby reducing product dilution and optimizing EGA sensitivity. Heated EGA adapters are designed to interface directly with the MS or FTIR transfer line to ensure continuous heating of the offgas stream through the furnace wall, dramatically reducing offgas condensation and improving EGA sensitivity.

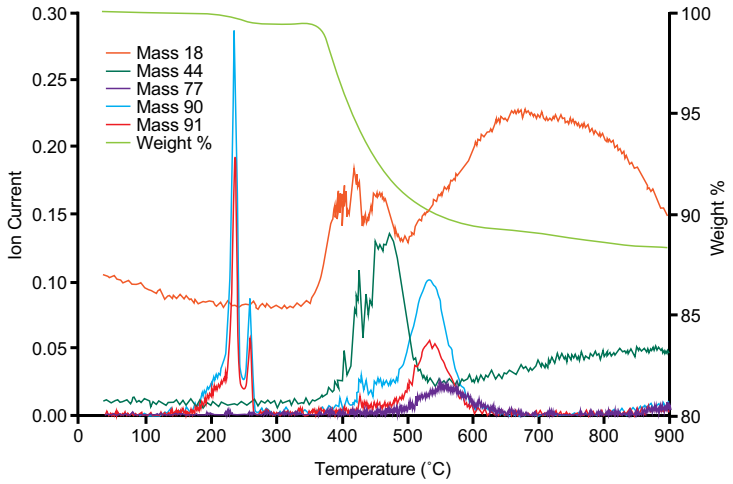
TA Instruments TRIOS software supports the importation of MS (trend analysis) and FTIR data (Gram-Schmidt and Chemigram reconstructions), allowing TGA and EGA data to be displayed on a common axis of temperature and/or time.

discovery mass spec

The Discovery MS is a benchtop quadrupole mass spectrometer, designed and optimized for evolved gas analysis. It features industry-standard technology configured for the efficient transfer, and rapid detection of offgas from the TGA furnace. Parts per billion (ppb) sensitivity is ensured with our state-of-the-art quadrupole detection system, including a closed ion source, a triple mass filter and a dual (Faraday and Secondary Electron Multiplier) detector system.This analyzer configuration is selected to optimize sensitivity and long-term stability performance.

Control of the experimental parameters and analysis of the mass spectral data is achieved through a user-friendly, recipe-driven software interface. Data collection can be triggered directly from the TGA software, and the resulting MS data can be combined with the corresponding TGA results for direct overlaying and comparison.

Parameter	Performance
Mass range (amu)	1-300
Mass Resolution	>0.5 amu
Sensitivity	< 100 ppb (gas-dependent)
Ionization Source	Electron Ionization
Detector System	Dual (Faraday and Second Electron Multiplier)
Sample Pressure	1 atm (nominal)
Data Collection Modes	Bargraph and Peak Jump
Scanning Speed	
Bargraph Mode	>50 amu/s
Peak Jump Mode	>64 channels/s
Transfer line Temperature	300 °C (fixed)
Transfer line	1.8 meters, flexible
Filaments	Dual, customer changeable
Capillary	Stainless Steel, changeable
Capillary size	I.D. = 0.22 mm
Inputs	Data collection controlled by TGA Trigger



specifications

Technical Specifications

Specification	Value
Temperature Range	Ambient - 1200 °C
Temperature Accuracy	±1 °C
Dynamic Temperature Precision	±1 °C
Isothermal Temperature Precision	±0.1 °C
Heating Rate Range	0.1 – 500 °C/min (linear) >1600 °C/min (ballistic)
Furnace Cooling (Forced air/N_2)	1200 °C to 35 °C in <10 min.
Sample Weight Capacity	750 mg
Dynamic Weighing Range	±100 mg
Weighing Accuracy	±0.1 %
Weighing Precision	±0.01 %
Sensitivity	<0.1 µg
Short-term Noise (rms)	<0.03 µg
Baseline Linearity (50-1000°C)	<1 µg
Baseline Drift (50-1000°C, 20°C/min, N_2 purge, no baseline subtraction)	<10 µg
Signal Resolution	0.001 µg

Instrument Features

Technologies	
Hi-Res TGA™	●
Modulated TGA™	●
Auto-Stepwise TGA	●
25-Position Autosampler	●
Integrated Electromagnet	●
Automated & Scheduled Calibration/Verification	●
Color Touchscreen User Interface	●
Heated EGA Furnace Adapter	○
2-Gas Input Gas-Delivery Module	●
4-Gas Input Gas-Delivery Module with Blending	○
Vacuum Operation	>10^{-2} torr
TGA/MS Operation	○
TGA/FTIR Operation	○

● Included
○ Optional

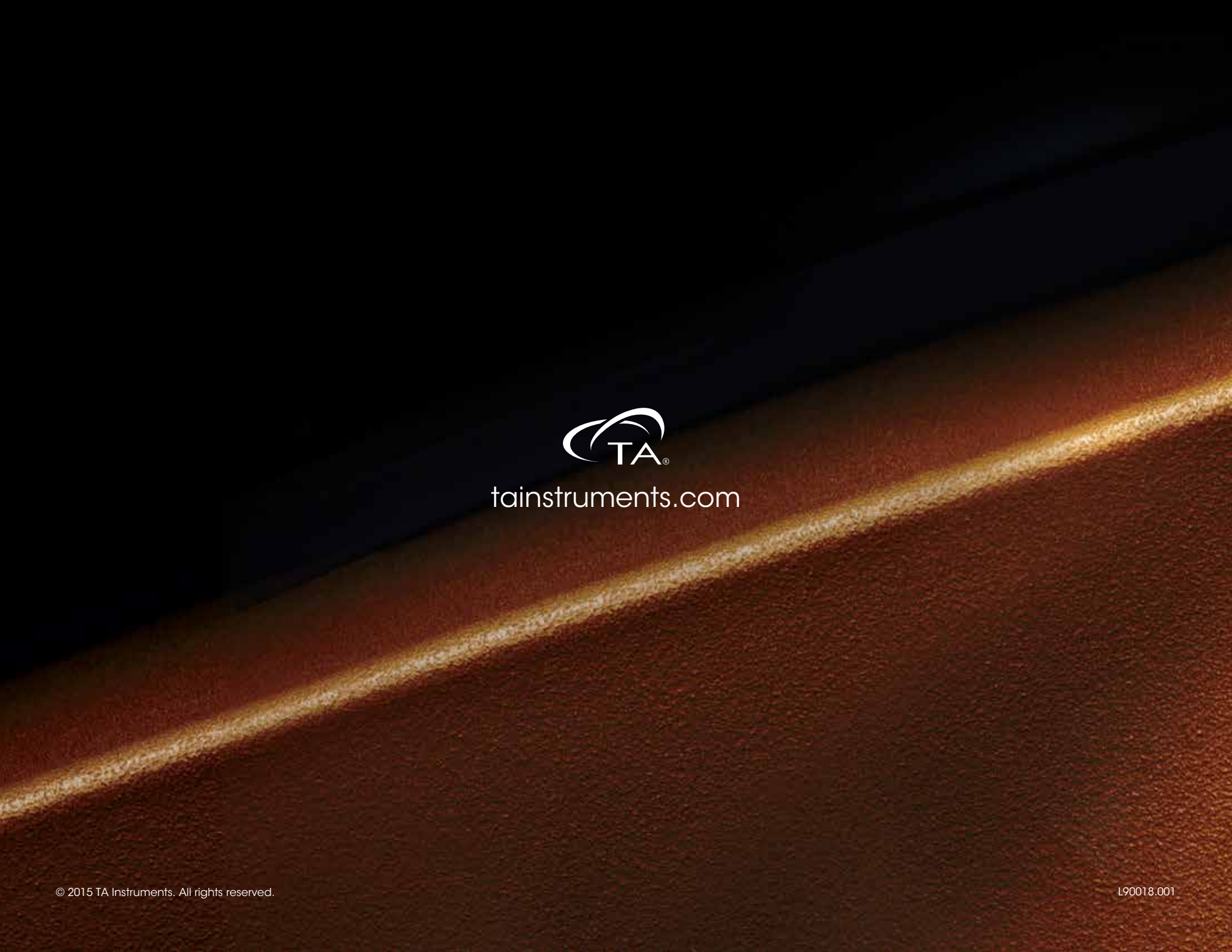
The Discovery TGA

DISCOVER A REVOLUTIONARY NEW USER INTERFACE

User Interface

The Discovery Series redefines the interaction with the instrument. The large, intuitive display and interactive menus guide the user to perform calibrations, control autosampler routines, and load or unload samples. Simple experiments can be programmed and initiated through the new QuickRun menu, and experimental progress can be monitored with the customizable real-time signal display.

NOTES



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