Pyris™ software

enabling high sensitivity thermal analysis
Your PerkinElmer thermal analysis instruments and data come to life on the Pyris™ software platform – the benchmark application for thermal analysis. Pyris is the preferred choice in thermal analysis because it is intuitive and user-friendly, and provides a wide-range of standard features and capabilities for maximum flexibility. PerkinElmer’s family of highly-sensitive thermal analysis instruments have been standardized on this powerful software platform. Add to this our superior customer service and support and you can be sure you are receiving a complete, robust system for accurate, reliable material characterization.

Whether you work in a research laboratory, an automated QA/QC lab, or on a stand-alone instrument, you can count on Pyris software to meet your thermal analysis needs.

**Easy-to-use**

To ensure the highest user satisfaction, we designed and continuously enhance Pyris software based on customer feedback. A common platform for all instruments makes it easy to use and quick to learn.

**Powerful**

Pyris software is easy-to-use without losing capabilities. The software has been designed to allow you to conduct data acquisition and analysis in one window, and run multiple analyzers simultaneously. A wide range of analysis options, data import/export flexibility and customizable features are provided to meet a wide range of needs.
HyperDSC support

*Increased sensitivity at greater speeds*

The fast data rates (up to 20 points per seconds) available on Pyris software make HyperDSC™ experiments routinely possible, even when scanning up to 500 °C/min. HyperDSC is a breakthrough method for materials characterization, providing sample information not normally obtained with traditional DSC. The technique is similar but with one exception: HyperDSC uses very fast controlled scanning rates, typically in the range of 200 °C/min to 500 °C/min. The greatest benefit is increased sensitivity, allowing you to run microgram samples and identify weak transitions such as the Tg in low amorphous lactose material, highly filled polymers, and numerous other polymer and pharmaceutical materials. An additional advantage is improved laboratory productivity resulting from increased sample throughput by a factor of 10 or more.

![Graph](#)

*Figure 1. Pyris software makes your HyperDSC experiments possible.*

**Quick Glance:**

- Minimizes risk of errors during calibration through Wizard approach
- Compares current measurement to reference curve during data collection
- Allows real-time calculation during sample run
- Provides fast method optimization during measurement
- Allows rapid document generation through Report Manager
- Technically compliant to 21 CFR Part 11 regulations
The following is a quick snapshot of the extensive capabilities and standard features of Pyris software.

**Multitasking**

Pyris software allows simultaneous operation of thermal analyzers from a single PC, providing productivity benefits for busy laboratories. Pyris software users can also benefit from the multitasking capability by performing data analysis, report generation and printing while running one or more measurements.

**Remote control**

If you need to monitor your thermal analyzer from outside the laboratory, remote control allows you to see the instrument viewer over a network connection from another location within your facility.

**Valet**

The convenient Valet feature allows creation of customized start-up and shut-down events. For example, Valet can be used to automatically condition and equilibrate your instrument prior to running experiments, or it can be used to automatically shut down the system after completion of runs. Valet runs outside of a method and can be used for any of the following tasks:

- Triggering events at a certain time of day
- Switching on/off power to instruments and accessories, such as chillers
- Triggering an external device using the X10 Relay switch

**Calibration Wizard**

The Calibration Wizard provides step-by-step guidance during the instrument calibration process (Figure 3). Easy-to-use by both novice and expert users, the Calibration Wizard assures the best procedure for instrument calibration.

**Event control using Methods Plus**

This feature triggers events based on behavior of monitored signals (Figure 2). For example, this feature can be used to stop a run when an instrument signal reaches a certain threshold (e.g. used for Oxidative Induction Time O.I.T. determinations) or it could be used to trigger an external event such as the control of a TG-MS coupling.

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**Figure 2.** Methods Plus provides event control.

**Figure 3.** Calibration Wizard walks you through the calibration process.
Fast method optimization

Being able to change a method during a sample run is important for laboratories which perform method development or which are analyzing unknown samples. Pyris software allows you to adjust the end temperature, to add new method steps such as an isothermal hold, extra cool or heat step while a measurement is running.

Real-time reference curve

The real-time reference curve is ideal for a quick QA/QC analysis (Figure 5). It allows you to overlay a reference curve on a running measurement for direct comparison.

Pyris Player

Pyris Player, a standard feature in Pyris software, is the backbone of our automation software (Figure 4). It can group like analyses together to simplify setup, and can sequence analyses in any order you desire. This feature is of great support for all instruments under Pyris software control. Pyris Player not only controls our autosamplers for greater efficiency, but also allows automatic optimization and analysis of the data collected.

Pyris Player is of great use for laboratories which are running without an autosampler. In this mode of operation, the Play list stops after the single run and instructs the user to load the next sample. Automation of data analysis, report generation and printing can be performed on user request.

Real-time calculation

The real-time calculation allows you to perform basic data analysis on the current sample measurement.

Real-time reference curve and real-time calculation can support your efforts in increasing laboratory productivity.

Fully integrated data file

Pyris software allows you to see all information such as the instrument calibration information, the measurement method, the raw data points and the calculated results in a single data file. This feature allows you to look back at any data file and determine exactly how the experiment was performed.
Define result properties

No matter what kind of thermal analysis laboratory you are part of, Pyris software has the flexibility to support your needs. The Define Result Properties feature allows you to select the best presentation of your results (Figure 8).

A wide range of calculation features

With Pyris software, you can choose to execute from a large variety of calculation options on a wide assortment of different curve types. Whether you are running a Differential Scanning Calorimeter (DSC), a Thermogravimetric Analyzer (TGA, TG/DTA) or a Mechanical instrument, data analysis is easy and reliable. (Please see specifications on Page 12 for a detailed list of calculations.)

Tolerance test

A tolerance test can be used to determine at one glance if a material meets predefined requirements (Figure 7). Acceptability limits (pass/fail) of a thermal event can be entered. When a thermal event is not acceptable, the play list will automatically stop, pause, or continue with a notation in the history file to alert the analyst.
Post-calculation limit adjustment
For added flexibility, a right mouse click option in the Data Analysis window offers easy access to data results and the possibility to conveniently change calculation limits.

Peak area calculation also available in kJ/mol
To increase the flexibility of your analysis, the peak calculation available in Pyris software provides an option to add the area result in kJ/mol.

MultiCurve
The MultiCurve™ feature allows you to save your view of several data files in a single file (Figure 9). This can include similar instrument files or an overlay of multiple thermal analysis instrument curves (such as DSC, TGA, TG/DTA or TMA). You can easily and quickly recall your MultiCurve data comparison at any time for review.

Report Manager
The Pyris Report Manager gives you the capability of exporting a Pyris data file (Figure 10) to a document in Microsoft Word® or HTML (Hypertext Markup Language) format including sample information, graphical images, results, text, data, tables, PDF formats – and more. The software provides user control of the design of the report and the information that the report contains. This report template can be re-used to conveniently facilitate the creation of new reports or to develop standard laboratory outputs.

Figure 9. MultiCurve feature.

Figure 10. Report Manager.
optional software packages enhance your capabilities

**Pyris Enhanced Security software**

In response to 21 CFR Part 11 and the increasing data security requirements in other industries, PerkinElmer’s Pyris Enhanced Security™ (ES) option offers the technical compliance tools needed to meet these mandatory regulations. With Pyris Enhanced Security, the regulated industries will be confident in their ability to provide the whole story about the generation of the data. It provides all of the required 21 CFR Part 11 technical compliance features to ensure that data integrity is always maintained:

- User Level Management & Security
- File Protection
- Audit Trails
- Electronic Signature

PerkinElmer makes its higher level security functionality available to both existing and new customers. Pyris ES is fully compatible with all instruments running on the Pyris software platform. Users may be required to purchase an update of the applications software (Pyris TA Manager software Version 5.0 or above) to run the Pyris ES option.

**Specific Heat (Cp) software**

When a material is subjected to a linear temperature program, the heat-flow rate into the sample is proportional to its instantaneous specific heat. Specific heat is most accurately, rapidly and easily determined with a power-compensation DSC which directly measures the heat flow as a function of temperature.

Two calculation modes are available:

- **2-curve method** allows you to run a baseline and sample to calculate the Cp and enthalpy change of the sample.
- **3-curve method**, also included in the package, allows you to be compliant with ASTM method 1269E that requires sample, baseline and reference runs for analysis of Cp and enthalpy change of the sample.

**StepScan DSC software**

StepScan DSC is a modulated temperature DSC technique that operates in conjunction with power-compensation DSC. The approach applies a series of short interval heating and isothermal hold steps to cover the temperature range of interest (Figure 11). This approach requires a DSC with very fast responsiveness to achieve short interval linear heating and isothermal steps.

![StepScan DSC software](image)

Figure 11. StepScan DSC software.

Pyris StepScan DSC software for the Diamond DSC and Pyris 1 DSC was conceived and developed to provide the ability to determine accurate specific heat capacity (Cp) under a variety of conditions. For example, moisture release by the sample or sample movement can produce changes in the baseline that produce errors in standard Cp determination. Using StepScan DSC minimizes these errors, and those caused by adverse experimental conditions. Moreover, StepScan DSC can provide information of both thermodynamic and kinetic processes of your sample. StepScan DSC is one of several techniques in the MTDSC family but is faster and easier to use than other MTDSC techniques.
Purity software

Pyris DSC Purity Software allows you to determine the absolute purity of an organic sample. Purity values are obtained from a single DSC scan and can even be obtained if the sample decomposes during melting. A Van’t Hoff plot (Figure 12) is used to calculate the purity and other values such as the heat of fusion, the theoretical melting point of a pure sample and a correction factor for the melting part below the lower calculation limit.

In polymers, crystallization usually gives rise to a semi-crystalline morphology consisting of crystalline and amorphous phases. A characteristic quantity in such a two-phase morphology is the enthalpy-based mass crystallinity. This software package provides a procedure which leads to an analyst-independent determination of transition enthalpies within the two-phase model (Figure 13). Combining such transition enthalpies with data available (mainly from the ATHAS Databank) makes it possible to determine temperature dependent crystallinity on the basis of DSC curves.

Temperature Dependent Crystallinity software

In determining the enthalpy change for a first-order transition, you are often faced with the problem of where to draw the so-called “base-line” for a DSC peak.

Pyris AutoStepwise TGA software

Pyris AutoStepwise TGA software for the vertical bottom-loading thermogravimetric analyzer (TGA) can be used to easily and fully separate the various transitions associated with multi-component materials, such as polymer blends, elastomers and materials containing solvents. This approach is very easy to use and is flexible in terms of handling different samples and applications. With AutoStepwise TGA, the sample heats at a constant rate until a significant weight loss event is encountered. The instrument then automatically holds the sample under isothermal conditions until the rate of weight loss becomes negligible. The TGA then resumes heating until the next significant weight loss is detected (Figure 14). Pyris AutoStepwise TGA software allows the user to change the various experimental criteria to accommodate a wide range of sample types and applications.
optional software packages enhance your capabilities

**Kinetics software**

The Pyris Kinetics software package is comprised of three accessories that can be purchased in a kit or separately:
- DSC Scanning Kinetics
- DSC Isothermal Kinetics
- TGA Decomposition Kinetics

**DSC Scanning Kinetics**

This software uses a multilinear regression to fit a single data curve, which has been taken at constant heating rate, to the Arrhenius relationship and thereby determine the pre-exponential factor, activation energy and order of reaction. Various calculation inputs can be adjusted in order to make the data more meaningful. For each calculation the statistical fit is indicated by the confidence limits for the kinetic parameters and by the fit of the partial area data to the Arrhenius relationship (the plot of ln k vs. 1/T). If satisfactory, the parameters and four key inputs can be saved with a comment. The reaction parameters can be used to predict the behavior of the tested material under either of two conditions – isothermal or adiabatic. With either calculation, the user can constrain one variable, such as temperature, time or percent reacted and look at a plot of the other two. Finally, a label-positioning routine allows the user to customize the screen displays and plots.

**DSC Isothermal Kinetics**

This software performs reaction kinetics calculations based on nth order and autocatalyzed reactions. By using the Avrami method, crystallization kinetics of a material can be evaluated. To perform the isothermal kinetics calculations, the software fits three to six data curves (Figure 15) that have been taken at a constant temperature, to the Arrhenius relationship and thereby determines the pre-exponential factor, activation energy and order of reaction. Various calculation inputs can be adjusted in order to make the data more meaningful. For each calculation the statistical fit is indicated by the confidence limits for the kinetic parameters and by observing ln k vs. 1/T and Log – Log plots. The reaction parameters can be used to predict the behavior of the tested material under isothermal conditions. The user can constrain one variable, such as temperature, time or percent reacted, and look at a plot of the other two.

True isothermal measurements are unique to a power-compensation DSC because it holds the sample at constant temperature while other systems control only the furnace temperature, not the sample. Thus power-compensation DSC is the only system to truly and correctly measure isothermal kinetics.

**TGA Decomposition Kinetics**

This software uses the Flynn and Wall method or a multi-linear regression (MLR) method to fit three to six data curves that have been taken at constant heating rates, to the Arrhenius relationship and thereby determine the pre-exponential factor, activation energy and order of reaction. Various calculation inputs can be adjusted in order to make the data more meaningful. For each calculation the statistical fit is indicated by the confidence limits for the kinetic parameters and by observing the plot of ln Beta vs. 1/T. The reaction parameters can be used to predict the behavior of the tested material under isothermal conditions. The user can constrain one variable, such as temperature, time or percent reacted and look at a plot of the other two.

![Figure 15. DSC Isothermal Kinetics](image-url)
Model Free Kinetics software

Model Free Kinetics (MFK) software can be used on either DSC or TGA and on any type of process. Examples include polymerization, curing, vulcanization and degradation of plastics and pharmaceuticals. For many years PerkinElmer has prided itself on having superior kinetics products and Pyris MFK software is in that same category. It is based on a modern approach to kinetics, similar to that used by our Isothermal DSC Kinetics and TGA Decomposition Kinetics. Without using any assumptions on the reaction model, MFK software calculates the activation energy of a chemical reaction as a function of the degree of conversion alpha. Using this information, alpha can be calculated as a function of time for various isothermal temperatures. This is considered to form a substantial advantage over other methods, where assumptions on the model of a chemical reaction have to be made. Especially when these models change during a reaction (and this occurs very frequently), large discrepancies between theory and experiment can arise. Model Free Kinetics does not suffer from these disadvantages. It is simple and wizard-directed, so it is easy to learn and use. It is focused on the information that most people want – namely, the time required to reach a given degree of completion.

OneSource Laboratory Services – comprehensive service and support for today’s results-driven lab

With over 60 years of experience, and as a world leader in analytical instrumentation, PerkinElmer is the right partner for your application needs. In concert with global distribution of instruments, turnkey systems, and consumables, we provide factory-trained global service and support. PerkinElmer’s OneSource™ Laboratory Services provides you with a comprehensive worldwide service offering that allows you to take care of business and set your sights on what matters most – results.

With over 1,000 professionals serving more than 125 countries worldwide, PerkinElmer is your single source for instrument care and repair, validation services, software and hardware upgrades, education, and more.

Start getting accurate, reliable results today! Visit us at www.pyris.com to learn more about how Pyris and PerkinElmer’s family of thermal analysis instruments can help your lab achieve results!
## Specifications

### Standard

<table>
<thead>
<tr>
<th>Curve types</th>
<th>Mathematical operations</th>
<th>Calculations</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Heat flow</td>
<td>• Subtraction</td>
<td>• Peak area/partial</td>
<td>• Calibration Wizard</td>
</tr>
<tr>
<td>• Un-subtracted heat flow</td>
<td>• Derivative</td>
<td>• Peak search</td>
<td>• Method change during a run</td>
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<td>• Baseline heat flow</td>
<td>• Average</td>
<td>• Onset</td>
<td>• Real-time reference curve</td>
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<td>• Enthalpy</td>
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<td>• GQT</td>
<td>• Real-time calculation</td>
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<td>• Heat flow</td>
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<td>• Phase angle</td>
<td>• Smoothing</td>
<td>• Delta Y</td>
<td>• Report manager</td>
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<tr>
<td>• Static force</td>
<td>• Addition</td>
<td>• Step</td>
<td>• Pyris Player</td>
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<td>• Delta X</td>
<td>• MultiCurve</td>
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### Optional

<table>
<thead>
<tr>
<th>Software packages</th>
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<tbody>
<tr>
<td>• Pyris Enhanced Security</td>
<td>• Pyris Kinetics</td>
<td>• Temperature Dependent</td>
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<td>(21 CFR Part 11)</td>
<td>• Pyris StepScan DSC</td>
<td>Crystallinity software</td>
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<td>• Pyris DSC Purity</td>
<td>• Pyris AutoStepwise TGA</td>
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### Requirements

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