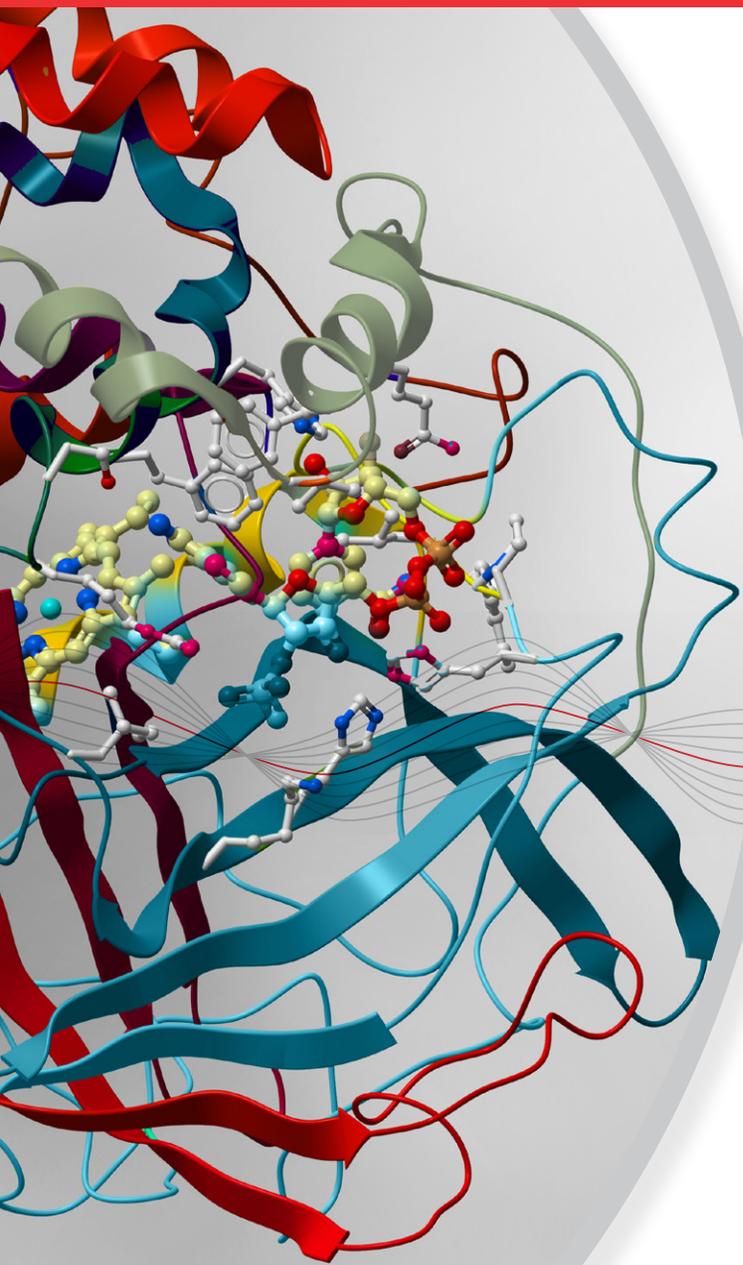


Enzyme assay automation for walkaway efficiency

Thermo Scientific Gallery Enzyme Master
Enzyme Analyzer



Enzyme efficiency, evolved

Get more from your enzyme method development process—starting with walkaway efficiency. Meet the Thermo Scientific™ Gallery™ Enzyme Master enzyme analyzer and Gallery™ Plus Enzyme Master enzyme analyzer, the first automated enzyme analyzers designed specifically for enzyme assay applications. Combining robust hardware and new custom designed software, these best-in-class solutions deliver fully-automated incubation settings, reagent additions, and precise measurement calculations—all with a touch of a button. They offer the smartest (and fastest) way yet to streamline method development and deliver reliable results from enzyme assay analysis.

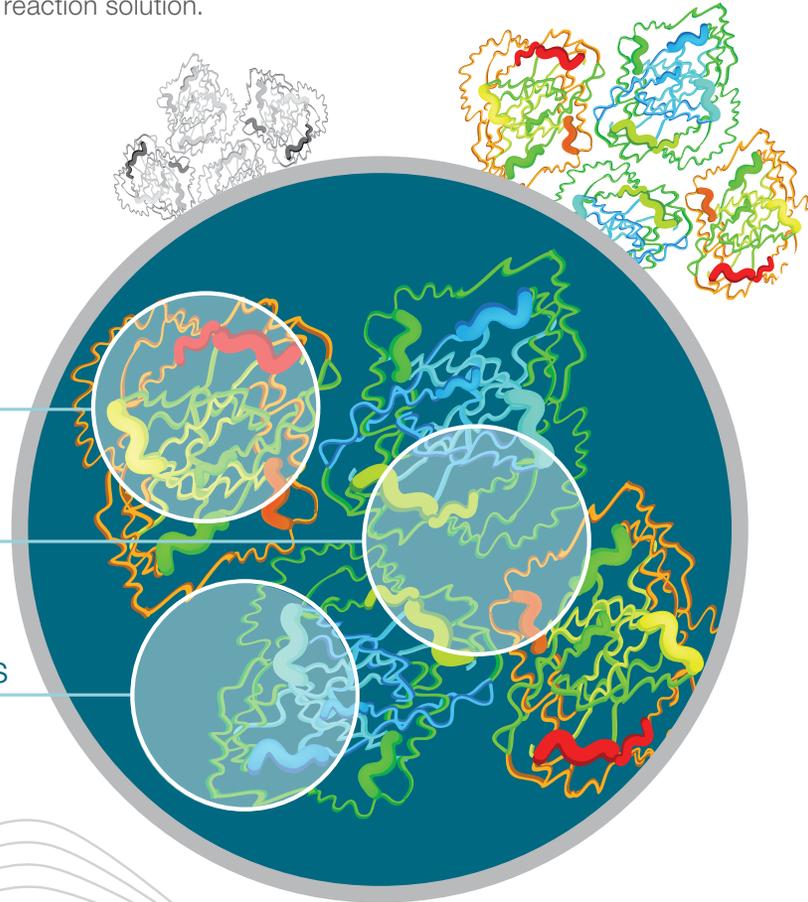
Enzyme analysis at-a-glance

Depending on the type of enzymes and their sensitivity, many different analytical methods are used. Most enzyme assays are based on spectroscopic techniques, with the two most commonly used being absorption and fluorescence.

The spectrophotometric assay is a classic enzyme test and still remains as the most widely used assay for the low cost and robust reproducibility. During a spectrophotometric assay, the operator follows the course of an enzyme reaction by measuring the changes in the intensity of the light absorbed or scattered by the reaction solution.

Three important enzyme measurements

- 1 Enzyme activity
- 2 Enzyme assay
- 3 Enzyme kinetics

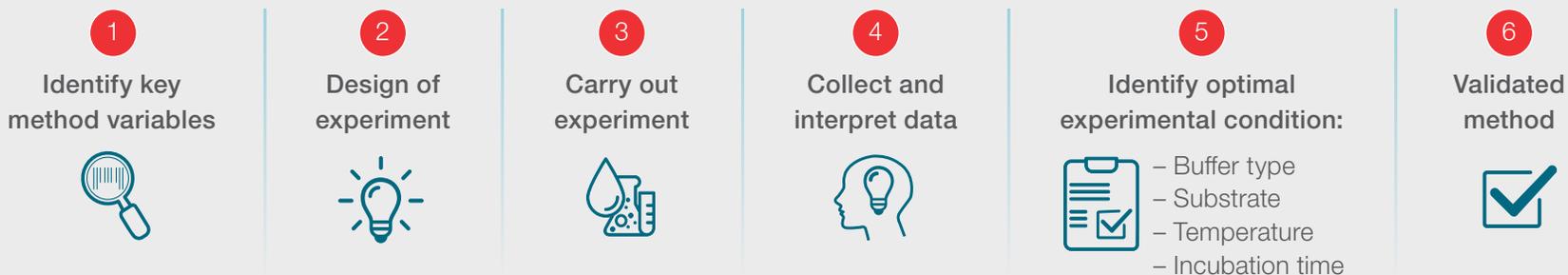


Enzyme assays based on photometry, fluorometry, 96-, 384-, or even 1536-well format microplate offer a high throughput alternative to the traditional spectrophotometers. The microplate format is convenient for high throughput analysis using a 200 µL assay volume. However, they suffer from temperature stabilization, absorption, and edge effect. The primary cause for the “edge effect” phenomenon is evaporation and is commonly associated with 96-well microplates. “Edge effect” is an issue attributed to the increased evaporation rate of circumferential wells compared to the centrally-located wells.

Often a great deal of work goes into assay development. They have limited incubation temperature and temperature stability and precision—which limits the application range. The enzyme activity depends on manifold factors and the general understanding of enzyme features is required for assay method development. Method development starts with identifying the key method variables through design of experiment (DoE), which requires many sets of samples to be tested for enzyme activities.

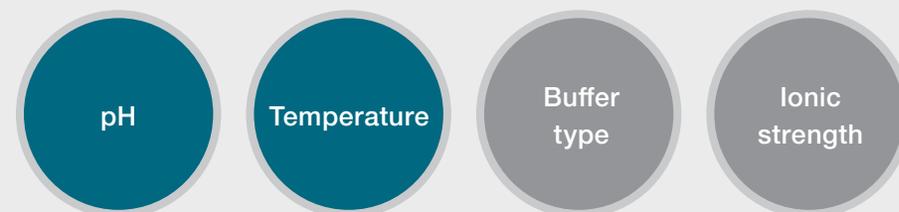
Method development and method transferability

Developing a reliable analytical method for enzyme assay or enzyme activity involves many different steps. Overall method development is tedious and time consuming.



Many variables. Precision required.

Measuring enzyme activity is a precise job and can be influenced by many variables.



Results accuracy is highly dependent on temperature stability. Just one degree temperature change can lead to a 4–8% variation in enzyme activity. For consistent and reproducible results, an enzyme assay should be carried out in well-defined conditions that can be duplicated in other laboratories. The variables like, pH and buffer type, ionic strength, and temperature must be strictly controlled.

Fixing the other variable will allow to correlate the change in measuring parameter and absorbance directly to the enzyme assay or enzyme activity. Too many method variables and maintaining a consistent measurement condition is critical in achieving reproducible results. Sample, buffer and substrate addition in a specific sequence and time interval are critical for enzyme assay.

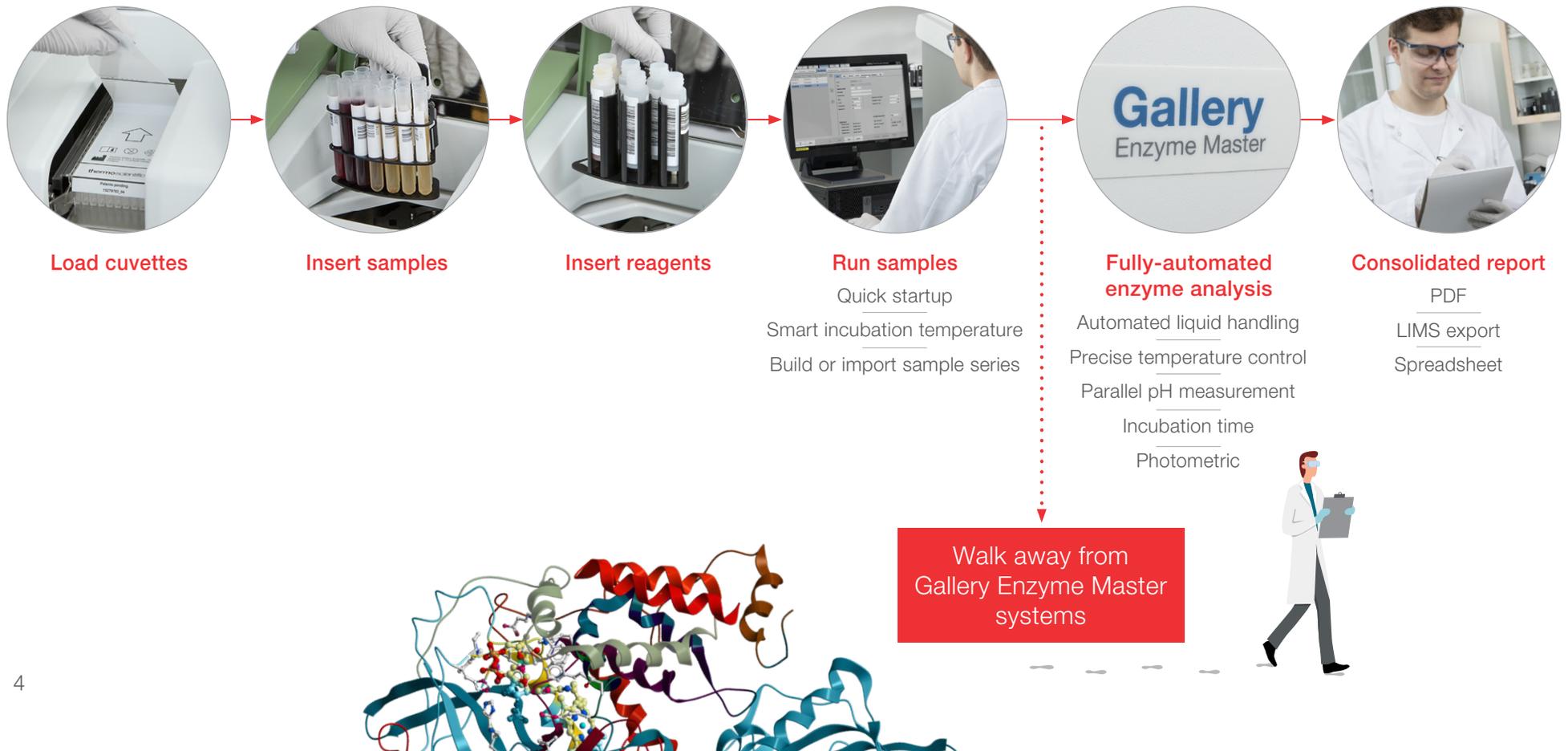
A better way: automate your enzyme assay analysis

From method development to routine analysis

Gallery Enzyme Master enzyme analyzer workflow

The Gallery Enzyme Master enzyme analyzer automates the critical steps involved in reliable enzyme analysis, including incubation time, incubation temperature, and precision liquid handling. It can efficiently manage many different enzymes and measuring conditions—all in a single instrument that offers consistent and reliable performance.

It is a fully-integrated walkaway solution. The testing workflow is easy to learn and can be left unattended, which improves throughput, system uptime, and providing true walkaway time for the operator. All necessary enzyme analysis steps are automated, which helps to control the variables and makes the overall method development easy and repeatable. The enzyme specific method parameter makes method transfer easy from R&D to quality control. Reliable enzyme assay development is critical and the automated enzyme analyzers simplify the overall method development and results reliability.



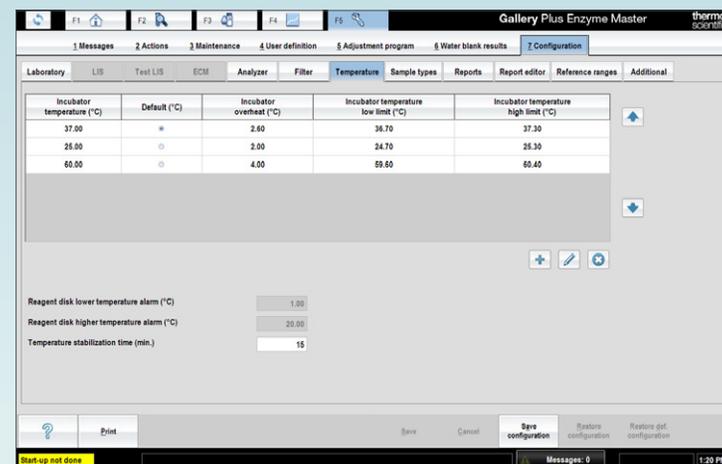
Set it and forget it: enzyme efficiency finally mastered

- Automated sample/buffer/substrate addition
- Smart incubation temperature and temperature limits
- Flexible temperature settings per assay needs
- Quick start function
- Fully-automated measurement and calculation
- Parallel pH measurement

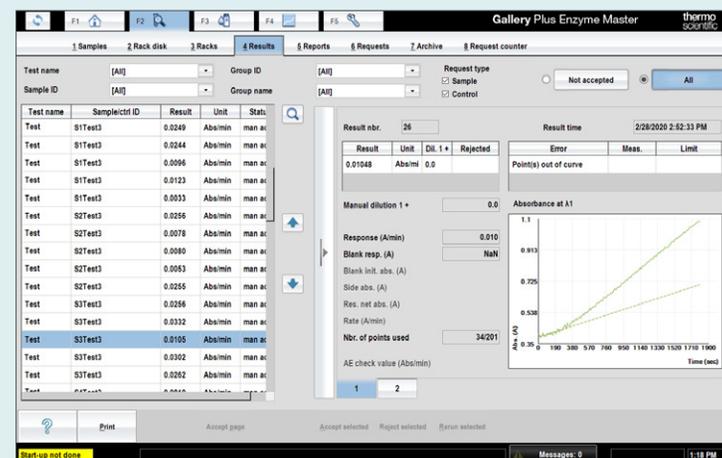
Benefits

- Fully-automated enzyme assay measurement
- Precise temperature control, temperature limits, and incubation time assures confidence in results
- Fully-automated reagent addition, mixing, and temperature control assures reproducible enzyme assay, enzyme activity, and enzyme kinetic results
- Customized enzyme software facilitates easy method development
- Automation provides walkaway efficiency. Optional electrochemistry unit measures pH of the samples and helps to maintain consistent experimental condition
- Time-stamped raw data, audit trail, user administration, and confident certificate of analysis (CoA)
- All the substrate additions and the measurements are done in a disposable low volume cuvette, which allows the performance of the real time kinetic measurement

The software provides the relevant temperature and kinetic data measurement.



Temperature editor



Kinetic data measurement

Meet the Gallery Enzyme Master systems— a walkaway solution

Automate labor-intensive and time-consuming enzyme assay analysis



Gallery Enzyme Master enzyme analyzer

Includes a combined sample and reagent disk for a maximum capacity of 90 samples and 30 reagents, with the ability to run up to 200 tests/hour.



Gallery Plus Enzyme Master enzyme analyzer

Accommodates 108 samples and 42 reagents in separate sample and reagent disks, with the capability to run up to 350 tests/hour.

200	Photometric tests per hour	350
30	Reagents capacity	42
45–90	Sample capacity	54–108
Yes	Optional ECM module	Yes
340–880 nm	Wavelength range	340–880 nm
340, 405, 420, 510, 520, 540, 575, 600, 660, and 700 nm	Dedicated filters for enzyme applications	340, 405, 420, 510, 520, 540, 575, 600, 660, and 700 nm
Yes	Optional filters available	Yes
25–60 °C	Incubation temperature range	25–60 °C
9 s	Data collection rate	9 s
98610004 With ECM: 98611004	Ordering number	98620004 With ECM: 98621004

Both Gallery Enzyme Master systems provide an integrated platform for electrochemical (pH and conductivity) measurements which can be run simultaneously with other photometric measurements.



Low-volume cuvette

- Reduced sample and reagent consumption: 2–240 μL
- Lowest waste generation and disposal cost
- No edging effect



Unique disposable DECACELL cuvettes

- The Thermo Scientific™ DECACELL™ cuvettes used are 10 independent reaction cells mounted together for truly discrete analysis
- Real time kinetic measurement
- Minimal or no carry over—improved result reliability

Fully-automated enzyme analyzer versus spectrophotometer

Fully-automated enzyme assay analysis



Traditional spectrophotometry

Automated steps

- Place samples and reagents solutions
- Choose method—start—walk away



Up to 350 results per hour



Manual steps

- Sample addition
- Heating bath
- Substrate addition
- Wait time
- Inhibitor addition
- Spectrophotometer measurement
- ~One result every 30 minutes



Limitations of spectrophotometric analysis

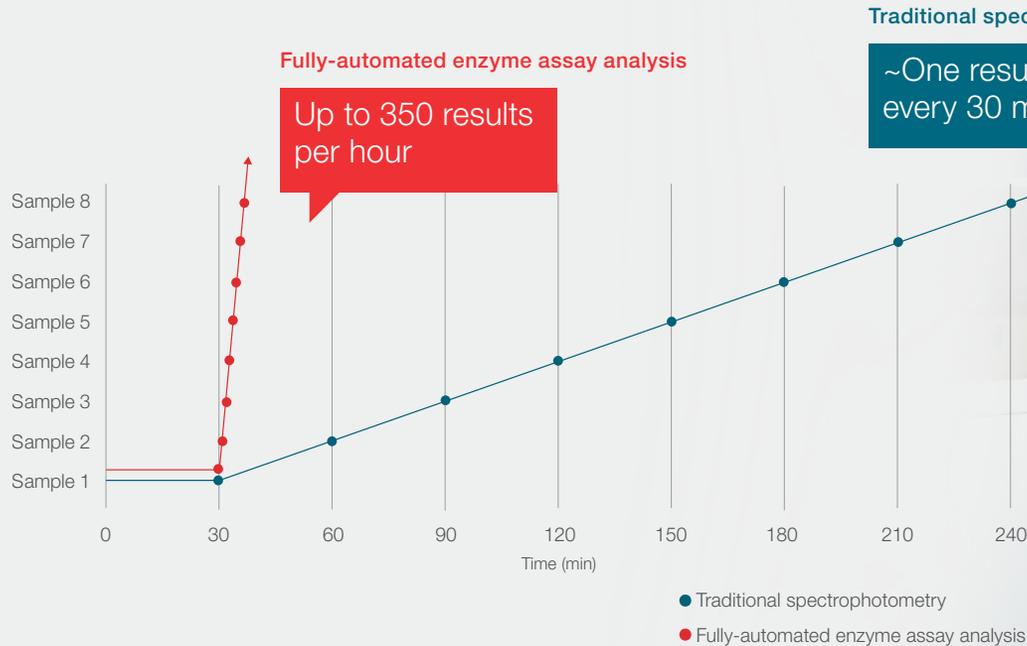
In the past, enzyme analysis was traditionally done via spectrophotometry. However, this method has several downsides that can negatively impact productivity and results reliability.

Based on the enzyme type, the spectrophotometric process could take 30–60 minutes per enzyme (from sample start to data collection).

- Manual steps
- Too many variables
- Inconsistent results
- Time-consuming method development
- Large reagent consumption
- Occupied lab personnel
- Expertise required



How automation improves productivity



The power of multitasking

Why settle for low throughput, when you can accelerate speed through automation? With the Gallery Enzyme Master systems, samples are simultaneously prepared and waiting in the queue—delivering results one after another. With automated enzyme analysis, the first sample still requires longer time, 20–30 minutes, depending on the incubation time. All the subsequent samples

are much faster due to system multitasking. While one sample is incubating at its set temperature, the second sample is prepared and waiting in the queue. After the first sample is done, sample two is done one minute later, sample three one minute after that, and so on. The cumulative effect is exponentially more results in less time, with less hands-on work.

Behind the automation: software designed for enzyme assay workflows

Thanks to dedicated software, enzyme assay workflows are incredibly simple, with practically no change over time from one method to another.

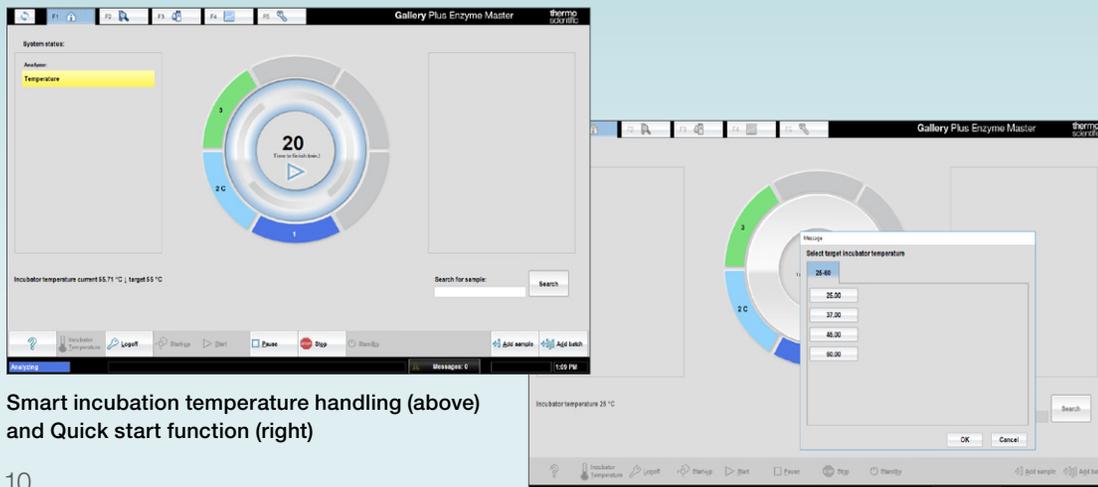
- Smart incubation temperature
 - Sample run table automatically starts with low temperature samples, progressing to high temperature samples
- Quick start function
 - System heats to a set temperature while the operator prepares samples
- Precision temperature controls $\pm 0.3^\circ\text{C}$
 - Prevents overheating
- Flexible method parameters for each enzyme type
 - Method-specific incubation temperature
 - Method-specific incubation time
 - Method-specific data collection duration
 - Sample/buffer/substrate addition sequence repetition
 - Measuring wavelength
 - Blank measurement
- Flexible result calculations for enzyme activity and enzyme assay
- Comprehensive audit trail
 - Fully-traceable results
- Flexible user administration
 - Unique software access levels for different users
- Raw kinetic data for further processing

Time	Absorbance	Measurement type
06:33.9	2.539943	Main
06:34.9	2.480205	Main
06:35.9	2.505705	Main
06:36.9	2.522956	Main
06:37.9	2.539943	Main
06:38.9	2.480205	Main
06:39.9	2.505705	Main
06:40.9	2.522956	Main
06:41.9	2.539943	Main
06:42.9	2.480205	Main
06:43.9	2.505705	Main
06:44.9	2.522956	Main
06:45.9	2.539943	Main
06:46.9	2.480205	Main
06:47.9	2.505705	Main
06:48.4	2.522956	Main

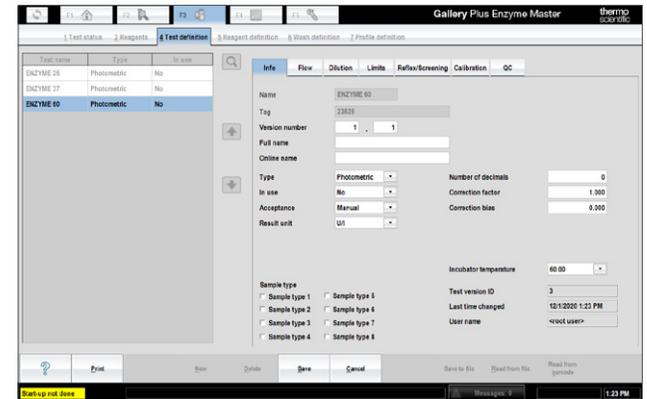
Time stamped raw data

Smart incubation

The system intelligently interprets all the samples and automatically groups the samples requiring the same temperature. It completes samples at the lowest temperature first, then heats the incubation chamber to next setting and completes those, repeating the process until all samples are done.



Smart incubation temperature handling (above) and Quick start function (right)



Method-specific incubation temperature

Enzyme efficiency—designed with you in mind

Top 5 reasons to consider fully-automated enzyme analysis

The Gallery Enzyme Master systems automate the critical steps involved in reliable enzyme analysis, including incubation time, incubation temperature, and precision liquid handling. It can efficiently manage many different enzymes and many different measuring conditions—all in a single instrument that offers consistent and reliable performance.



1

Confidence in results

- Precise temperature control
- Temperature overheating limits
- Accurate incubation time to the seconds
- Superior temperature control and lack of edge effects



2

Reproducibility

- Fully-automated liquid handling (sample, buffer and substrate addition, and mixing)
- Disposable cuvettes (no carryover)
- Smart incubation temperature



3

Productivity

- Walkaway solution
- Easy to use, train, and maintain
- Many enzymes, many substrates, many methods—all on a single instrument



4

Fully-automated workflow

- Easy, automated method development
- Easy method transfer
- Enzyme-specific method parameters all in one central place



5

Traceability

- Time stamped raw data
- Audit trail
- User administration





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