Creoptix
a **Malvern Panalytical** brand

WAVEsystem

Next-generation bioanalytical
instruments for drug discovery

The wave of the future in kinetics

Kinetics in hours instead of days

Modern label-free technology meets no-clog microfluidics and automated software to provide superior affinity and kinetic data quality and challenging sample compatibility.

Real samples,
real data.

The Creoptix WAVEsystem puts a breakthrough level of kinetics analysis at your fingertips by pushing the boundaries of affinity range and sample compatibility. The system's exceptionally high data quality, sample compatibility and automated software facilitates drug discovery and enable new inroads into R&D.

Intuitive wizards

Move seamlessly from sample to data in a simple stepwise process. Automated software enables outputs to be generated at the touch of a button. Wizards guide the user through experimental set up, kinetic evaluation and report generation, with open access formats supporting both LIMS integration and export of data files.

- waveRAPID – kinetics (on-rate, off-rate, affinity and Rmax) from a single well
- DIrect Kinetics – automated data evaluation
- Ligand Screening Wizard – a faster, flexible way to screen and characterize antibodies
- CFCA Wizard – a calibration-free approach to quantification

Innovative microfluidic cartridge

Innovative design and patented microfluidic cartridge to support crude samples, pathogenic samples, harsh solvents, and large particles up to 1000 nm normally only achieved with plate-based assays for kinetic analysis not possible before.

- No-clog for crude samples
- Chemical-friendly for harsh solvents
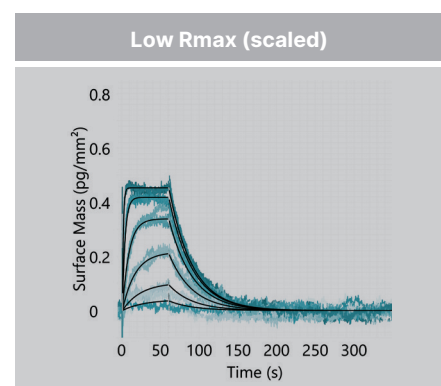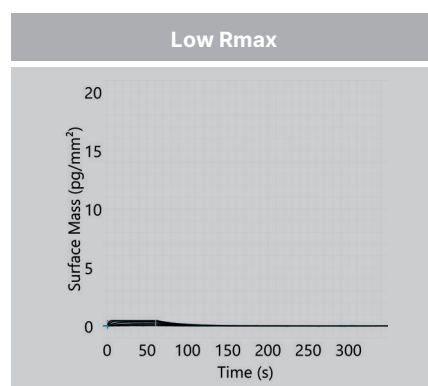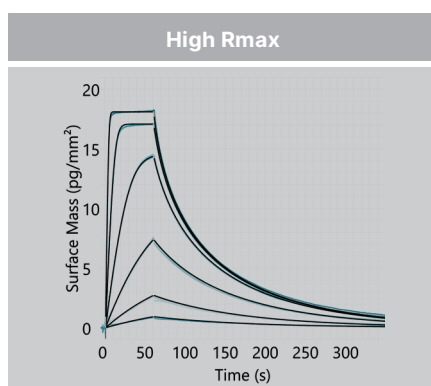- No valves for fast transitions

High signal-to-noise ratio for high sensitivity

Engineered around a proprietary Grating-Coupled Interferometry (GCI) technology, the Creoptix WAVEsystem builds on waveguide interferometry to achieve superior resolution in signal and time. With low limits of detection, the WAVEsystem generates accurate kinetic rates, affinity constants, and concentrations of label-free biomolecular interactions, even at low analyte abundance, with no loss of definition.

- Work with low immobilization levels
- Work with large ligand-to-analyte molecular weight (MW) ratios

Small molecules can't hide anymore

With the industry's fastest kinetics and utmost sensitivity, the WAVEsystem offers a whole new level of previously unattainable interaction data.

Ligand: CAII (29 kDa) at two different immobilization levels
Analyte: Acetazolamide (222.25 Da)

Measure biological interactions in relevant contexts fast

Confidently detect and quantify biological interactions in real-time, for high-quality kinetic data across a broader range of samples than traditional equipment.

WAVEcontrol

With **waveRAPID®**, Creoptix introduced a new way of measuring kinetics to boost throughput. Instead of relying on a titration series in conventional kinetics, waveRAPID injects a single concentration, pulsing the sample over the sensing surface at increasing durations. From a single well, kinetics can be derived: the on-rate, off-rate, affinity and Rmax.

The **WAVEcontrol software** has an intuitive design that mirrors the way you work. Automated functions guide your from experimental design and assay setup to data evaluation and reporting.

Use the **Ligand Screening** wizard for screening and full kinetics (waveRAPID), and choose from guided protocols for three different surface chemistries. You can up and run assays easily and intuitively thanks to the "ligand block". The wizard also works in perfect harmony with the "target level" function, ensuring that ligands are always captured at the same density level for correct data interpretation.

The **CFCA** wizard – for calibration-free concentration analysis (CFCA) – was designed to help you dive straight into your workflow - there's no need to purify crude samples first. Since only the analyte binds to the ligand, you can quantify the "active" portion of the sample quickly and easily using the CFCA Wizard and without the need to calibrate the curve or standard first.

WAVEchips

No-clog microfluidics accommodates of a broad range of sample types to preserve activity and biological context, saving time from detrimental purification steps and clogging that takes other systems offline.

Fast kinetics (150 msec transition time) facilitate reliable analysis of off-rates of up to 10 s^{-1}. Sharp parallel injections are synchronized on all flow channels for accurate referencing.

- WIth no-clog microfluidics, minimize downtime.
- Discover kinetics in physiologically relevant conditions (e.g. 100% serum or plasma).
- Study membrane proteins without time-consuming sample preparation or purification.
- Experiment with non-traditional solvents, including high percentages of acetonitrile and DMSO
- Variety of chip surfaces available

WAVEcore

The WAVEcore houses our patented Grating-Coupled Interferometry (GCI) technology. Together with a temperature-controlled autosampler that can handle 2x 48-vial racks, 96- or 384-well plates or combinations thereof, the WAVEcore offers the sensitivity to work with low immobilization levels and large ligand-to-analyte molecular weight (MW) ratios.

The patented GCI design leverages and enhances the intrinsic benefits of waveguide interferometry to exceed the sensitivity levels of traditional SPR.

In contrast to SPR, GCI provides an evanescent field that penetrates less into the bulk and extends the light-to-sample interaction length for superior signal-to-noise ratios (<0.015 pg/mm^2).

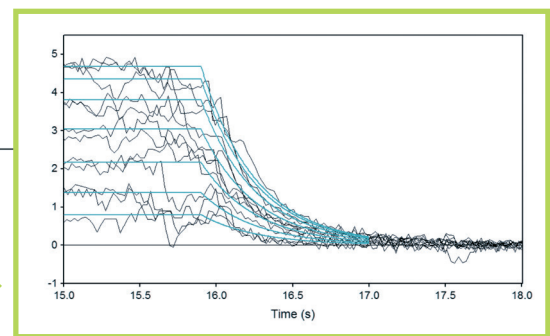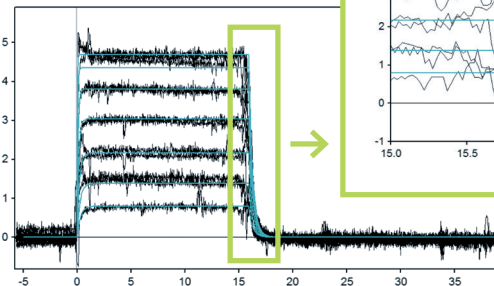**label-free data**
like you've never
seen before

WAVE δ

Confidence in kinetic measurements

Real is measuring kinetics of biological interactions in relevant contexts. Only the WAVE innovative microfluidic cartridge tolerates native, physiological and harsh conditions, providing access to new data not possible before.
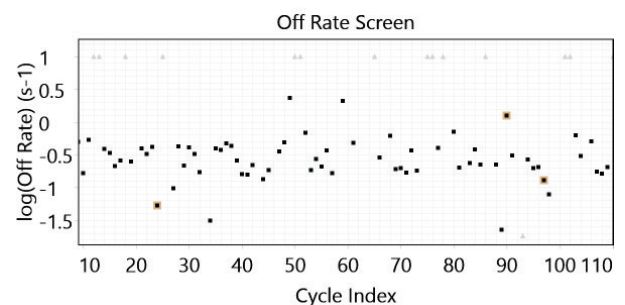
real is crude small molecule development

Capture fast off-rates of weakly binding fragments and high-quality low potency leads for more suc-cessful drug discovery.

- Separate binders from non-binders with off-rate kinetic analysis of crude reac-tion mixtures

- Resolve weak binders with off-rates as fast as 10 s^{-1}.

- Measure in non-traditional solvents, in-cluding high percentages of acetonitrile and DMSO.

- More space in the well plate to measure full kinetic data with only one injection using waveRAPID.

- Kinetic information in hours instead of days using waveRAPID.
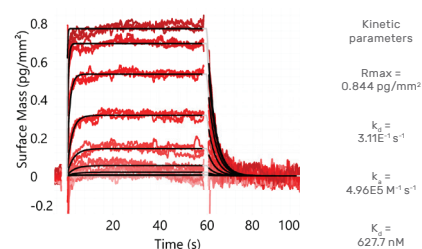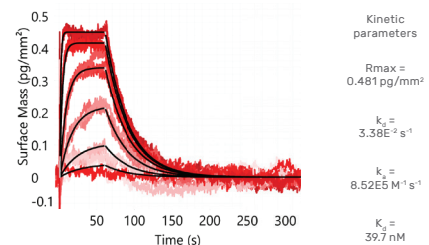

Ligand: Carbonic Anhydrase II (29 kDa), Analyte: Methylsulfonamide (95.1 Da), k_{off} = 2.79 s^{-1}

Off Rate Screen

Push the limits and generate high-quality binding kinetics with our sensitive GCI technology and resolve data at very low responses.

- Kinetics analyses of molecules with dramatically different size ratios.

- Reliable kinetics at R$_{max}$ below 1 pg/mm^2.

Kinetic parameters

Rmax = 0.481 pg/mm^2

k_d = 3.38E^{-2} s^{-1}

k_a = 8.52E5 M^{-1} s^{-1}

K_D = 39.7 nM

Kinetic parameters

Rmax = 0.844 pg/mm^2

k_d = 3.11E^{-1} s^{-1}

k_a = 4.96E5 M^{-1} s^{-1}

K_D = 627.7 nM

real is (less) diluted
Serology - serum, plasma and more

Measure antibody kinetics in (un)diluted serum and plasma while reducing cross-contamination and potential clogging. Accurately measure binding kinetics in conditions closer to real life and confidently characterize the tightest binders in:

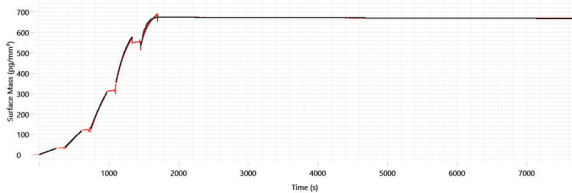- 100% blood serum or plasma
- Cell extracts
- Cell culture supernatant

0% Serum

90% Serum

real is natural
Biologics development

Measure more than just affinity, even in the low pM range, while confirming and entichign ELISA data.

- Slow off-rate analysis of high-affinity binders
- Detection of anti-drug antibodies (ADA) in the low ng/ml range
- Identify the most effective antobody pairs in diagnostic development

Kinetics analysis with 24h dissociation of an antibody with low pM affinity

Crude membranes capture via biotin

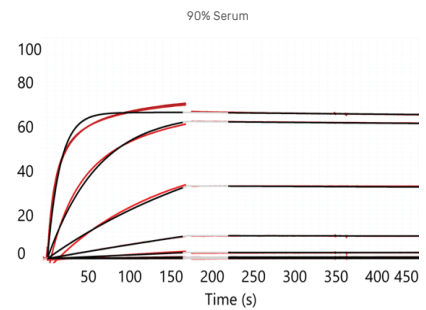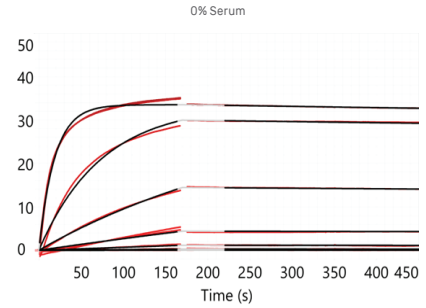### real is native
Membrane proteins

Stay close to native state in cell membrane and study interactions with large binding partners. Study binding kinetics onto membrane proteins and retain their conformation and activity for more successful drug discovery

- Push the limits and generate high-quality binding kinetics and resolve data at very low responses
- Save time and precious samples by studing membrane protein pharmacology using only partially solubilized, unpurified material
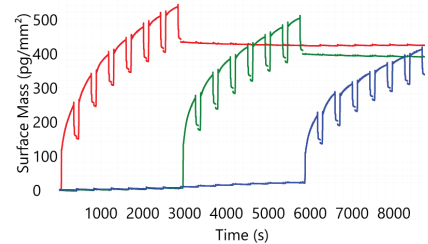
Nanobody kinetics on GPCR

Kinetic parameters	Rmax = 6.435 pg/mm^2	k_a = 7.1E^5 M^{-1} s^{-1}
k_d = 2.87E^{-3} s^{-1}	K_d = 406.7 nM	

Virus-like particles, liposomes, and nanodiscs present unique challenges

The resultant size of these structures - used to preserve membrane protein integrity and activity - combined with a tendency to aggregate, can cause microfluidics channels to clog. They can be run reliably and repeatedly on the WAVEsystem with no impact on performance or sensitivity to:
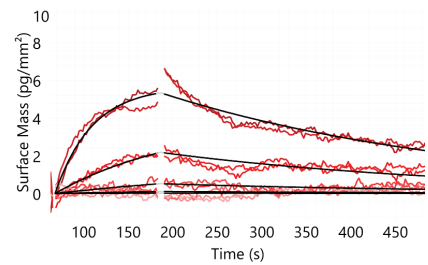
- Valveless microfluidics to analyze and characterize larger molecules.
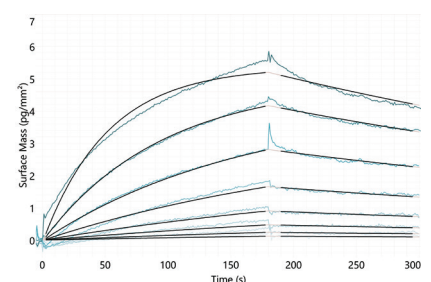- Ensure more reliable data by protecting the sensor from inadvertent handling.

Ligand: CXCR4 - VLP Analyte: anti-CXCR4 antibody

Creoptix WAVE

GENERAL	
Noise (RMS)	<0.01 pg/mm^2 @ 1 Hz
Drift	<0.3 pg/mm^2/min
Readout Frequency	1 Hz, 10 Hz or 40 Hz
Association Const. Range	k_a = 10^2 – 5x10^7 M^{-1} sec^{-1} (small molecules) k_a = 10^2 – 3x10^9 M^{-1} sec^{-1} (large molecules)
Dissociation Const. Range	k_d = 10^{-6} ... 10 sec^{-1}
Analysis temperature range	15°C – 40°C
Molecular Weight Limit	No lower limit
waveRAPID Functionality	No
FLUIDICS	
Flow Channels / Path	2, parallel
Channel Referencing	1–4 and 4–1 or 2–3 and 3–2
Flow Cells	Sealed, disposable, integrated into disposable WAVEchip
Flow Rate	1 – 400 µl/min
Crude Sample Robustness	Yes
SAMPLE HANDLING	
Sample Capacity	2x microtiter plates (96 or 384 well, standard or deep well) or vial racks (48 positions of 1.5ml)
Buffer	1 buffer
Degasser	Built-in
Injection Volume	< 450 µl, 100 µl typical
Sample Volume Required	Injection volume plus 15-50 µl (application dependent)
Sample Storage Temperature	Ambient or 4°C – 20°C regulated
Sample Recovery	Yes
Automation	120h of unattended operation
DATA TREATMENT	
Information Provided	Kinetic affinity (k_a, k_d, K_D)
Graphs	Real-time curves, multiple curve overlays, fit, report point plots
Data Extraction	Curves, k_a, k_d, K_D tables, graphs, reports
Data Analysis	Fully automated data evaluation
Kinetic Models	Predefined models including 1:1 interaction, mass transport, heterogenous ligand, conformational change and bivalent
Direct Kinetics	Yes

Creoptix WAVEdelta

GENERAL	
Noise (RMS)	<0.01 pg/mm^2 @ 1 Hz
Drift	<0.3 pg/mm^2/min
Readout Frequency	1 Hz, 10 Hz or 40 Hz
Association Const. Range	k_a = 10^2 – 5×10^7 M^{-1} sec^{-1} (small molecules) k_a = 10^2 – 3×10^9 M^{-1} sec^{-1} (large molecules)
Dissociation Const. Range	k_d = 10^{-6} ... 10 sec^{-1}
Analysis temperature range	4°C – 45°C (max 20°C below ambient)
Molecular Weight Limit	No lower limit
waveRAPID Functionality	Yes

FLUIDICS	
Flow Channels / Path	4, parallel
Channel Referencing	Any combination of the 4 channels
Flow Cells	Sealed, disposable, integrated into disposable WAVEchip
Flow Rate	1 – 400 µl/min
Crude Sample Robustness	Yes

SAMPLE HANDLING	
Sample Capacity	2x microtiter plates (96 or 384 well, standard or deep well) or vial racks (48 positions of 1.5ml)
Buffer	Automatic switching between 4 buffers
Degasser	Built-in
Injection Volume	< 450 µl, 100 µl typical
Sample Volume Required	Injection volume plus 15-50 µl (application dependent)
Sample Storage Temperature	Ambient or 4°C – 20°C regulated
Sample Recovery	Yes
Automation	120h of unattended operation

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Data Analysis	Fully automated data evaluation
Kinetic Models	Predefined models including 1:1 interaction, mass transport, heterogenous ligand, conformational change and bivalent
Direct Kinetics	Yes

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instead of days

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WAVE$^\delta$

creoptix
sensors

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