Biacore™ 1K system

LABEL-FREE INTERACTION ANALYSIS

Biacore™ 1K is a one-needle SPR system that transforms interaction analysis — making it simpler and faster to use without compromising quality. Biacore 1K system is cost-effective with low operating expenses.

Our six-flow-cell Biacore 1K system offers flexibility that can grow with your group's need for sample capacity, sensitivity, and throughput. Now you can focus on generating the consistent and reproducible data needed in your research, drug development, or analysis in a GxP-regulated environment.

Biacore 1K SPR system provides ease of use and shortens your time to results

- Analyze multi-complex formations in one run using the novel injection command, ***Poly***.
- Result based exploratory studies with full control on instrument using ***Interactive run***.
- Seamless setup and analysis with our predefined methods — no programming skills required.
- Flexible software tools accelerate assay development, making your workflow more efficient and effective
- More time for your research and less time spent on training to operate the instrument.
- Simpler data interpretation: compile, visualize and explore data with results in minutes.

Biacore 1K system is designed to be scalable and can be upgraded to Biacore 1K+ system to accommodate your evolving research needs. You can use Biacore 1K system across a wide range of applications, molecules, and both pure and complex samples — from small fragments to large viruses.

The intuitive and modular Biacore Insight Software platform makes it intuitive and easier to use. The optional, application-specific software extensions allow you to maximize platform versatility and minimize time to conclusive results, irrespective of experience, use case, or stage of research.

Application methods are easily transferred to other labs with Biacore 1 series systems and the higher throughput systems of Biacore 8 series systems.

Fig 1. Biacore 1K system is based on a robust SPR platform with the flexibility that makes it easier and faster to generate consistent and reproducible interaction data with minimal effort. Biacore 1K system can be upgraded to Biacore 1K+ system.

Microfluidic design maximizes assay set up and reduces your running cost

The six flow cells can be addressed individually as single flow cells (1, 2, 3, 4, 5, 6) and in pairs (1/2, 3/4, 5/6). Figure 2 shows a schematic representation of the six flow cells through the channel flow path. The wider blue path is in contact with the sensor surface. White circles are inlets and outlets. The six flow cells triple the number of interaction analyses per sensor chip and reduce sensor chip cost by 2/3.

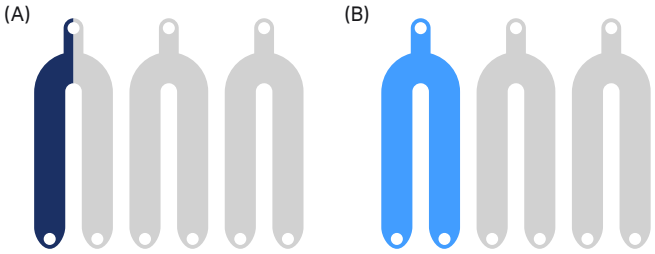

Fig 2. Flow cell addressed as individuals (A) or in pairs (B).

Table 1. Performance overview for Biacore systems with six versus two flow cells restricted to pair wise flow cell addressing

Application example	Recommended flow cell addressing	Biacore 1K system	Biacore X100 system	Benefits of three instead of one flow cell pairs per sensor chip
		6 flow cells	2 flow cells	
• Yes/no binding studies • Kinetic determination • Affinity determination	One reference flow cell, serial analysis	1 active flow cell, 1 reference flow cell	1 active flow cell, 1 reference flow cell	Additional two flow cell pairs available • Triples the number of interaction analyses per sensor chip • Reduces sensor chip cost by 2/3

Increased analytical capacity speeds up assay development, analysis and enables you to verify and confirm results using the extra flow cells. You can save assay time, sample quantity, and sensor chips (Table 1).

High quality data and low short-term noise

The high-quality instrument design, low short-time noise, and high signal stability across Biacore 1 series systems allow sensorgrams to be clearly separated down to very low resonance unit (RU) responses. Analysis may be performed directly in crude matrices such as a membrane preparation, avoiding unnecessary sample handling that risks negatively affecting the activity level.

The higher sensitivity allows for lower surface densities to be used, may give fewer secondary interactions, increase the proportion of the target accessible for binding, and simplify data interpretations.

Remarkable sensitivity, Biacore 1K system detect samples down to 1 pM

Concentration analysis is supported via Biacore Insight Concentration and Potency Extension. The remarkable sensitivity of the instrument enables detection down to 1 pM (Fig 3).

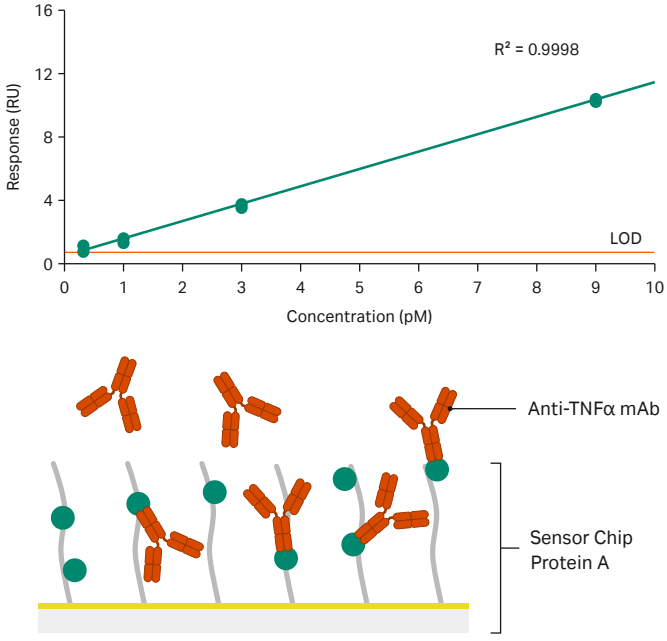

Fig 3. Biacore 1K system was able to detect analyte responses of 1 pM. Ten replicates of buffer were used to calculate the limit of detection (LOD = average + 3× standard deviation). (Data: Human monoclonal anti-TNFα antibody [0.3 to 27 pM] interaction to Series S Sensor Chip Protein A using 20 min injection time).

Expand application versatility

Biacore 1K system comes with innovative injection tools that allow for versatile assay design.

The ***Dual*** command in Biacore Insight Control Software sequentially injects two solutions without any intermediate running buffer or wash steps (Fig 4). This approach can address a frequent problem in epitope binning — namely, the low affinity between the antigen and the first antibody. This low affinity can otherwise lead to the dissociation of the antigen, causing an underestimation of the binding level for the second antibody.

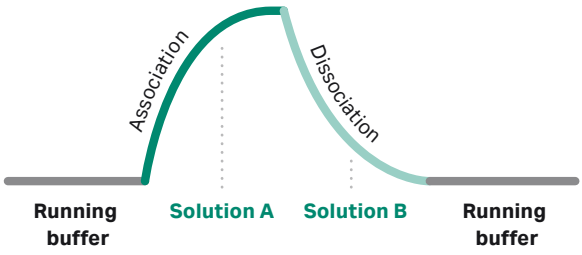

Fig 4. The ***Dual*** command injects two solutions in sequence with no intermediate washing steps between Solution A and Solution B.

The ***ABA*** command allows two different solutions to be injected in the same cycle in the following order: solution A, solution B, then solution A (Fig 5). This enables buffer scouting to be run directly from a microplate or applied in running competition assays. Data gathered using ***ABA*** can be fitted to kinetic models in Biacore Insight Evaluation Software.

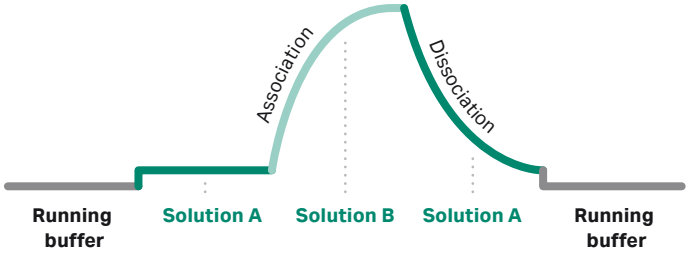

Fig 5. The ***ABA*** command allows two different solutions to be injected over the sensor surface in the same cycle in the following order: Solution A, Solution B, then Solution A.

With the ***Poly*** command, Biacore Insight Software gives you new possibilities for studies of protein complexes — including those formed by multivalent molecules such as PROTACs (Proteolysis targeting chimeras) and their binding partners. The ***Poly*** command enables the injection of three to five solutions in sequence with no intermediate running buffer or washing steps (Fig 6 and Fig 7).

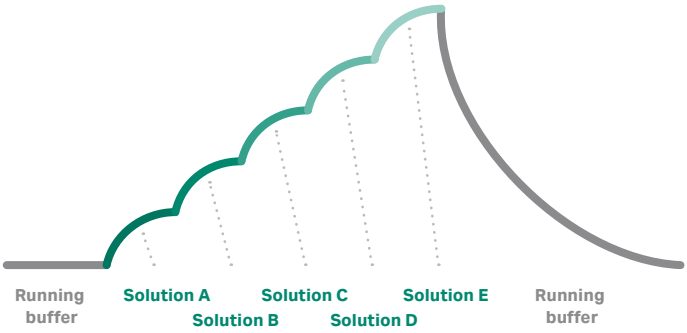

Fig 6. The ***Poly*** command enables multi-complex formation by injection of three to five solutions (Solution A to Solution E) in sequence with no intermediate running buffer or washing steps.

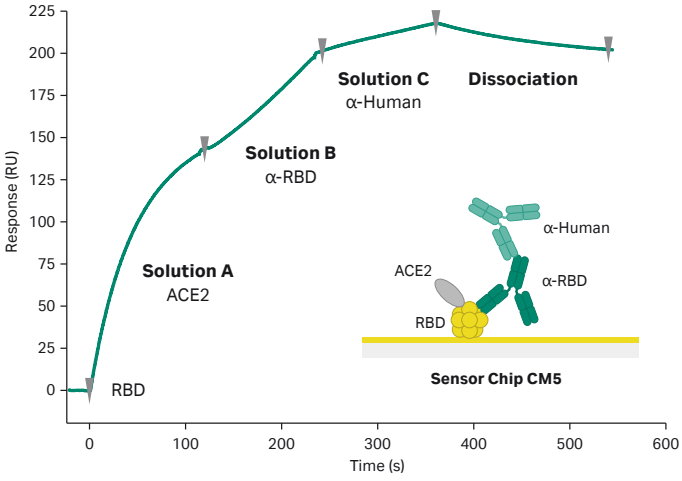

Fig 7. ***Poly*** command used as a tool to study protein complex formation. The Receptor Binding Domain (RBD) of the viral spike glycoprotein SARS-CoV-2 was coupled on Serie S Sensor Chip CM5. We used the ***Poly*** command with three injections to inject the ACE2 human receptor (Solution A), a monoclonal antibody against RBD (Solution B) and a mouse anti-human IgG (Fc) antibody (Solution C).

Fast and flexible exploratory studies

Interactive run within Biacore Insight Control Software lets you take full control of the instrument while providing immediate feedback. In contrast to run methods, cycles are not defined in advance. Instead, you add commands and make decisions based on the result of previous injections, thereby building up the cycle as the run is proceeding.

Interactive run is well suited for:

- Confirmation of surface activity after ligand attachment.
- Quick tests, such as testing whether new analytes can bind, or comparing a small group of analytes.
- Assay development for finding suitable concentration spans, injection times, and regeneration procedures.
- Training and demonstration of Biacore 1K SPR system

In Biacore 1K system, ***Interactive run*** data has full evaluation support, including kinetic fitting, giving a first value of affinity in your very first run (Fig 8).

Fig 8. Example of an ***Interactive run***. Each cycle contains an analyte injection (variable concentration) and a regeneration step. The full data set (seven was then fitted to a 1:1 model in Biacore Insight Evaluation Software (data not shown). Analyte: beta-2-microglobulin. Ligand: Anti-beta-2-microglobulin amine coupled to Sensor Chip CM5.

Queue up methods to free up time and save sensitive samples

Maximize instrument usage by utilizing the ***Activity queue*** feature. Anything done to prepare, run or maintain the instrument can be added to the queue. These options include changing buffer solutions, chip docking, immobilization methods, analysis methods, temperature changes to the cleaning procedure — thereby minimizing unnecessary waiting times. When working with sensitive samples, ***Activity queue*** and the temperature-controlled sample hotel is a powerful combination that lets you save sample, time, and costs. When using Immobilization checkpoint, if any immobilization results fall outside the set acceptance criteria, ***Activity queue*** is paused, and user input is required to resume or stop the ***Activity queue***. If immobilization results are within the acceptance criteria, the ***Activity queue*** continues with subsequent activities (Fig 9).

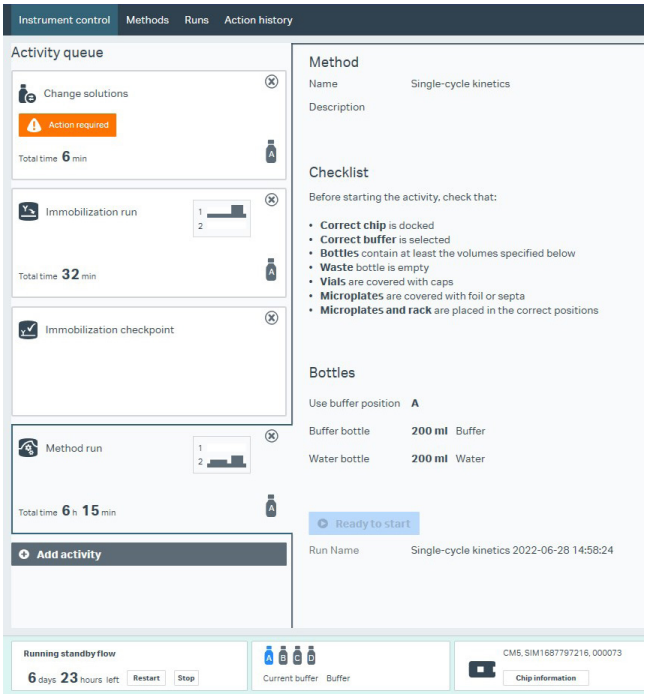

Fig 9. ***Activity queue*** lined up with ***Change solutions***, ***Immobilization run***, ***Immobilization checkpoint*** followed by a Biacore Single Cycle Kinetics (SCK)™ method run.

Visualize your SPR data

The flexible result export feature in Biacore Insight Evaluation Software provides the means to export selected, or comprehensive data for continued data processing, result reporting, or storage in the company database.

You can transfer data into Microsoft PowerPoint format (Fig 10) and modify the presentation of your data using the extensive tool set and layouts in the presentation application — this makes it easy to share data with your colleagues and peers. Additional export options, JSON and XML format, are available in Biacore Insight Data Integration Extension.

The combination Biacore SPR instrument and Biacore Insight application-specific software extensions provide support from run setup to data evaluation and brings new ways to visualize your data.

Fig 10. The flexible result export feature in Biacore Insight Evaluation Software lets you export selected or comprehensive data for continued data processing, result reporting, or storage in a shared database. You can export data in Microsoft Excel, PDF, and Microsoft PowerPoint format. In this example, you can see a streamlined analysis of a kinetics experiment as a presentation in slide format.

Support for working in regulated environment

Cytiva has a comprehensive offering to support the use of Biacore systems for interaction analysis in a regulated environment. The optional products and services that can be used in combination with Biacore 1 series and Biacore 8 series systems are:

- Biacore insight GxP Extension: a software that enables operations in compliance with current GxP regulations designed with a high level of built-in support for 21 CFR Part 11 compliance. Features include: ***Data integrity***, ***User authorization levels***, ***Audit trail***, ***Version history***. ***Electronic signatures*** are used for and approval of regulated procedures for run and evaluation of data and for approval of evaluated results.
- Validation support package: a system assessment report, conformance certificates, and Biacore Insight GxP handbook with recommendations for system setup considering 21 CFR Part 11 compliance.
- Change Control Notification Service: a subscription service allowing users to be notified of system changes, giving increased process robustness in regulated environments.
- Cytiva's OptiRun™ Qualification Service: ensures that systems are kept in a qualified state throughout their lifetime.

For more details, please see the Biacore Insight GxP Extension and qualification services for implementation and use in regulatory environment.

Systems specifications

Technical specifications and characteristics	
Detection technology	Surface plasmon resonance (SPR) biosensor
Information provided	Kinetic and affinity data (k_a, k_d, K_D), specificity, selectivity, screening data, epitope binning, concentration and relative potency data
Data presentation	Monitoring of real-time sensorgrams or evaluation data for result tables and result plots
Analysis time per cycle	Typically 2 to 15 min
Automation	60 h unattended run time
Sample type	Small molecule drug candidates to high molecular weight proteins (also DNA, RNA, polysaccharides, lipids, cells, and viruses) in various sample environments (e.g., in DMSO-containing buffers, plasma, and serum)
Required sample volume	Injection volume plus 20 to 40 µL (application-dependent)
Injection volume	1 to 400 µL
Flow rate range	1 to 100 µL/min
Flow cell volume	60 nL
Flow cell height	50 µm
Data collection rate	1 or 10 Hz

Sample/reagent capacity	1 × 96- or 384-well microplate, normal, and deep-well 1 × reagent rack with 21–43 positions compatible with 0.7–4.4 mL vials
Typical run times	Clean screen (384-well plate): 6 h
	Binding level screen (384-well plate): 15 h
	Affinity screen (48 analytes): 27 h
	Kinetic analysis (30 analytes): 15 h
	Concentration analysis (24 samples): 3h
	Epitope binning, 5 × 5 array (5 cycles): 1.5 h
Analysis temperature range	25°C to 37°C
Sample storage	4°C to 37°C (at least 18°C below ambient temperature)
Sample refractive index range	1.33 to 1.39
In-line reference subtraction	Automatic
Number of flow cells	Six in one channel
Dimensions (W × H × D)	755 × 725 × 666 mm
Net weight total	95 kg
Mains requirements	Processing unit: autorange voltage 100 to 240 V~, frequency 50/60 Hz
Power consumption	Processing unit: max. 350 VA

Minimum computer requirements
64-Bit Windows 10 Enterprise or Professional Edition (English) or 64-Bit Windows 11 Enterprise or Professional Edition (English)
CPU with at least four cores, 2 GHz or faster
At least 16 GB internal memory
At least 200 GB free hard disk space
Screen resolution at least 1920×1080
One USB2 port available for instrument connection

SQL database server requirements
Biacore Insight Software includes SQL Server Express 2022 for local database setup only. A separate networked SQL database is required for full functionality. Performance improvements are seen with SQL Server Standard, SQL Server Enterprise, or SQL Data Warehouse version 2022 (available separately from Microsoft).

Note: The server needs to be supplied by the end user. Contact your local representative for the latest information regarding on-site requirements.

Typical working ranges	
Association rate constant (k_a)	Proteins: up to 3×10^9 M^{-1} s^{-1} LMW molecules: up to 5×10^7 M^{-1} s^{-1}
Dissociation rate constant (k_d)	10^{-6} to 1 s^{-1}
Sample concentration	≥ 1 picomolar (pM)
Molecular weight detection	No lower limit for organic molecules
Short term noise typically	< 0.03 RU (RMS)
Baseline drift typically	< 0.3 RU/min
Blank subtracted drift	< ±0.003 RU/min
Immobilized interactant consumption	Typically 0.03 to 3 µg/flow cell

Compliance	
Compliant with	CE, cETLus, EAC, FCC, ICES-001, KC, RCM, UKCA
Safety	IEC/EN/UL/CSA-C22.2 61010-1, IEC/EN/UL/CSA-C22.2 61010-2-081, EN ISO 12100
Electromagnetic compatibility (EMC)	EN/IEC 61326-1, FCC Part 15 B, ICES-001
Environmental	EN 63000, China RoHS

Ordering information

Product	**Product code**
Biacore 1K system Includes: Biacore 1K instrument (29712576); Two licenses for Biacore Insight Software (29310602)	29726017
Biacore 1K+ Upgrade Kit Includes: Upgrade of Biacore 1K to Biacore 1K+ performed by Cytiva field service	29719933
Biacore Insight Software extensions	Various licenses[1]

[1] See cytiva.com/biacore for details of the various e-licenses available.

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