



NGC™ Chromatography Systems

Module Selection Guide

BIO-RAD

DESIGNED BY YOU. BUILT BY BIO-RAD.

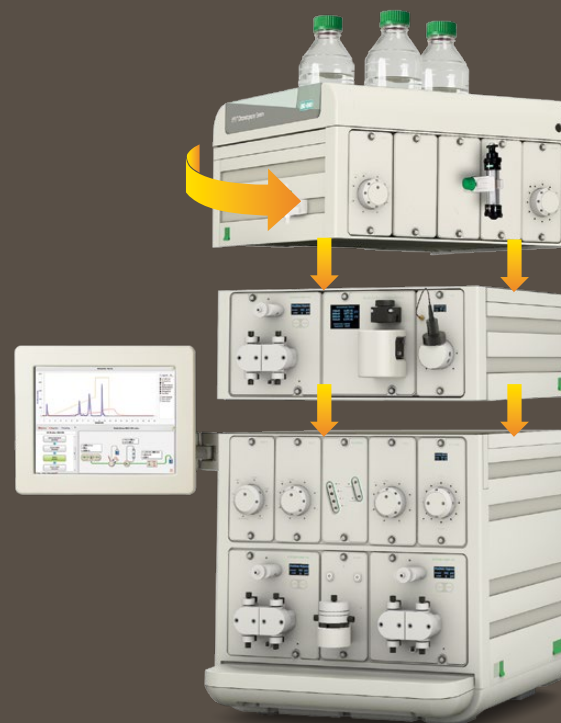
TRULY MODULAR AND CUSTOMIZABLE

The forward-facing modules allow easy-access plumbing of the system. Each system is completely open to redesign with plug-and-play modules, allowing individual customization to meet your needs and application requirements.



EXPANDABLE

Expand your system capabilities with the addition of tiers and modules. Modules can be moved and tiers can be rotated, letting you position all components for maximum convenience and efficiency.



THE NGC LIQUID CHROMATOGRAPHY FAMILY — DESIGNED TO MEET YOUR SPECIFIC PURIFICATION NEEDS

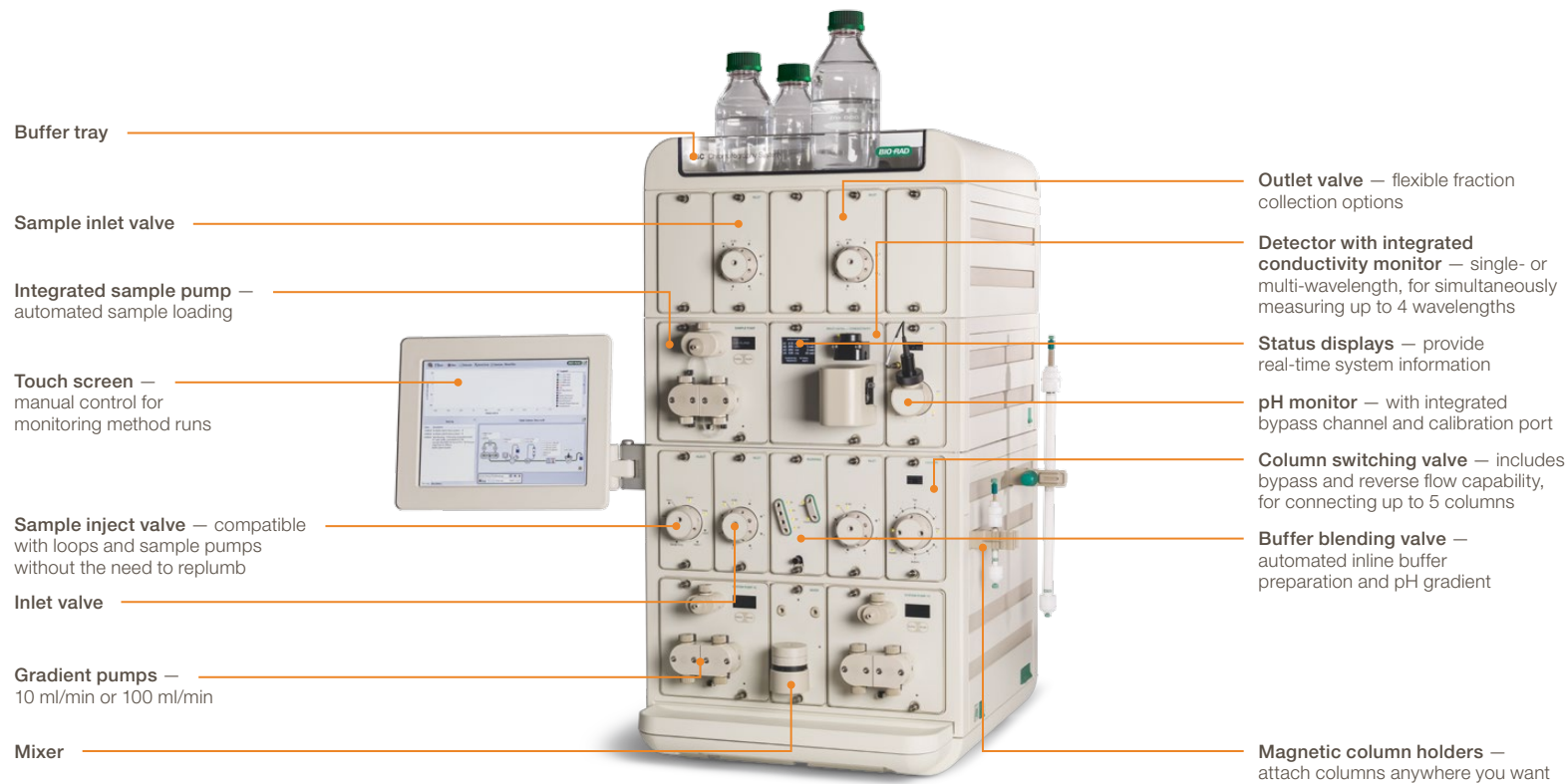


Fig. 1. NGC Discover™ System.

The NGC family of medium-pressure chromatography systems offers a single solution that scales to fit your purification requirements.

The NGC System's truly modular design provides multiple configurations to align with the requirements of every individual scientist.

The NGC instrument's small footprint means it can be used on a lab bench, in a laboratory refrigerator, or in a coldroom.

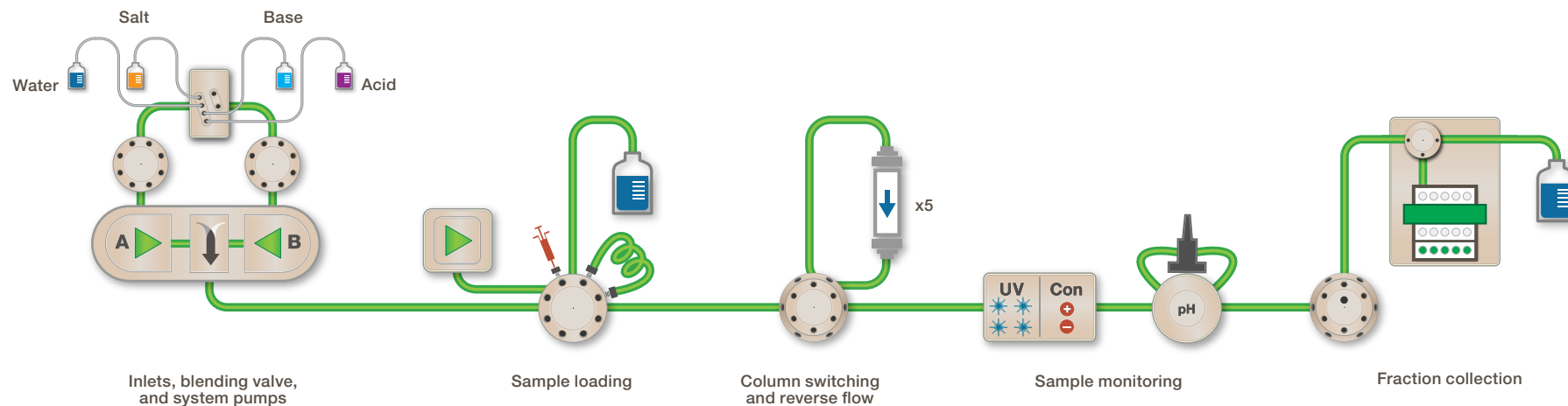
Each system comes with a touch screen, providing instant status updates and manual control of system functions.

The 10 ml/min and 100 ml/min preconfigured instruments — available as the NGC Quest™, NGC™ Quest Plus, NGC Scout™, NGC™ Scout Plus, and NGC™ Discover Systems — are designed with increasing automation and throughput capabilities to serve a wide range of laboratory needs.

The magnetic column clamps allow you to mount the columns exactly where you want them. This minimizes the bench space needed for traditional column holders and simultaneously reduces long tubing connections.

The pumps, detectors, and pH monitor all have LED displays to show real-time status and module performance.

NGC SYSTEM CAPABILITIES SCHEMATIC



PUMP INLETS AND AUTOMATED BUFFER BLENDING

System Pumps

A chromatography system with multiple users, applications, and purification requirements often uses a variety of column types and sizes. The NGC Chromatography System enables you to swap out pump modules to meet your specific requirements.

The NGC family of systems can house up to three high-precision pumps: two system (gradient) pumps and one sample pump, all integrated within the instrument.

The system pump modules include a display for real-time monitoring of pump status, flow rate, and pressure readings.

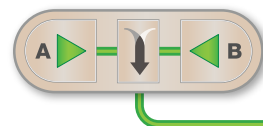


Fig. 2. System pumps.

F10 Reciprocating Piston Pump

- Flow rate: 0.001–10 ml/min at 3,650 psi (25.2 MPa)
- Ideal for small-scale preparative purifications
- Can also be used for HPLC separations

F100 Reciprocating Piston Pump

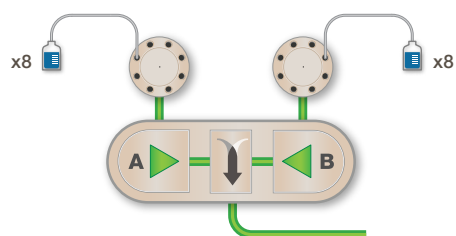
- Flow rate: 0.01–100 ml/min at 1,450 psi (10 MPa)
- Flexible flow rate range
- Ideal for scale-up applications

Catalog #	Description
7884002	NGC F10 Pump Module
7884003	NGC F100 Pump Module

Buffer Inlet Valves

Optimizing separation conditions can be a time-consuming process, especially if you have to switch out bottles and tubing each time.

The NGC Buffer Inlet Valve Module enables automated switching between buffers to accelerate method development, column cleaning, and regeneration.



- No need to replumb between runs
- 8 buffer inlets per valve
- Inlets can be labeled within the software
- Inlets can be dedicated to cleaning and storage solutions
- Each system pump can have an 8-port inlet valve

Fig. 3. System pumps with inlet valves.

Catalog #	Description
7884006	NGC Inlet Valve Module

Buffer Mixer Module

The NGC Mixer Module homogenizes buffers from the two system pumps (A and B) and includes a mixer motor assembly as well as an integrated system pressure sensor.

Gradient Flow Rate Range

- F10 pump: 0.001–20 ml/min
- F100 pump: 0.01–200 ml/min

Gradient Composition Accuracy

- F10 pump: $\pm 0.5\%$ (3–97%B, 0.25–10 ml/min up to 3,650 psi/25 MPa)
- F100 pump: $\pm 0.8\%$ (5–95%B, 1–100 ml/min up to 1,450 psi/10 MPa)

Mixer Volume

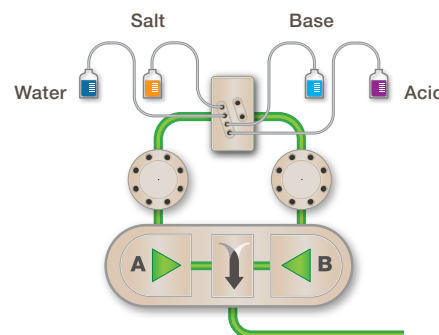
- 263 and 750 μ l included with the F10 pump
- 750 μ l and 2 ml included with the F100 pump (5 and 12 ml barrels available)

Catalog #	Description
7884018	NGC Mixer Module

Buffer Blending Valve

Achieving the correct pH required to perform most separations can be challenging. The NGC Buffer Blending Valve speeds up buffer preparation and enables pH scouting by automating inline buffer preparation.

Using acid, base, water, and salt stock solutions, the system can generate specific pH buffers over a linear salt gradient or a pH gradient at a specific salt concentration.



- Enables inline buffer preparation
- Enables pH scouting
- Multiple preprogrammed buffer recipes
- Buffer pH range: 2.7–10.3
- Maintains full gradient capability
- High flow capability
 - F10 pump: 20 ml/min
 - F100 pump: 200 ml/min

Fig. 4. System pumps with buffer blending valve.

Catalog #	Description
7884010	NGC Buffer Blending Valve Module

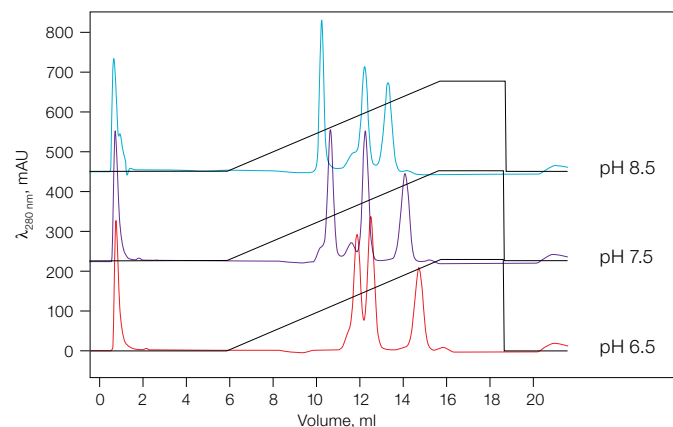


Fig. 5. pH scouting with a cation exchange standard containing α -lactalbumin, ribonuclease A, cytochrome C, and lysozyme in a simple buffer mixture automatically titrated to different pHs.

SAMPLE LOADING OPTIONS

Whether you are loading a few microliters using a static loop or liters using a dedicated sample pump, the NGC System offers a complete range of options to minimize the risk of sample loss, to automate sample loading, and to prevent the introduction of air into your system.

Sample Injection Valve

- Accurate sample loading
- Compatible with fixed volume loops, variable volume DynaLoop™ Sample Loops, sample pump, and autosampler
 - No need to replumb
 - Sample volumes: μL to L

Catalog #	Description
7884007	NGC Sample Inject Valve Module

Sample Pump Module

Automated sample application can be achieved using the NGC Sample Pump Module.

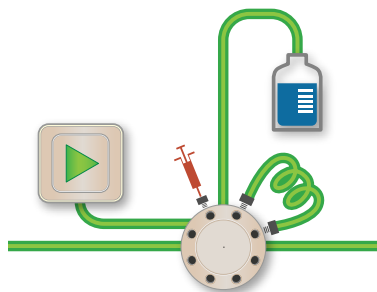


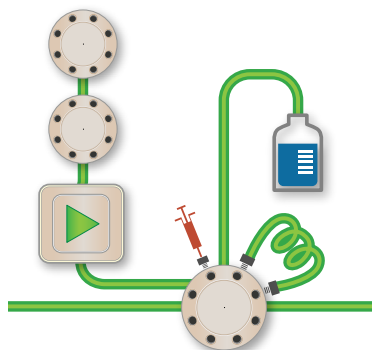
Fig. 6. Sample inject valve with sample pump.

- Dedicated pump eliminates contamination of system pumps
- Ideal for automated large-volume sample loading directly to the column
- Repetitive accurate sample loading via a fixed volume loop
- Connects directly to sample inject valve without replumbing
- Flow rate: 0.01–100 ml/min at 1,450 psi
- Flow rate accuracy: $\pm 2\%$
- Sample viscosity range: 0.5–10 cP
- Integrated pressure sensor
- Multiple large volume samples can be loaded sequentially using up to two inlet valves

Catalog #	Description
7884004	NGC Sample Pump Module

Sample Inlet Valve

Automated sequential sample loading of multiple large-volume samples can be achieved using inlet valves with the sample pump.



- No need to replumb the sample pump between samples
- 8 sample inlets per valve
- Inlets can be labeled within the software
- Up to two sample inlet valves can be used with the sample pump

Fig. 7. Sample pump with two sample inlet valves.

Catalog #	Description
7884006	NGC Inlet Valve Module

Air Sensor

Introducing air into your system can damage columns and waste precious samples.

The NGC Air Sensor Module enables the detection of end of buffer and sample, thus protecting your system and saving you time.

- Module accepts up to four air sensors
- Compatible with large- and small-bore sensors
- Air sensor extension module available for additional sensors

Catalog #	Description
7885017	NGC Air Sensor Module

Note: Third-party autosamplers and external detectors can be used with the NGC System via the NGC Signal Import Module (SIM) (catalog #7884016).

COLUMN SWITCHING AND REVERSE FLOW

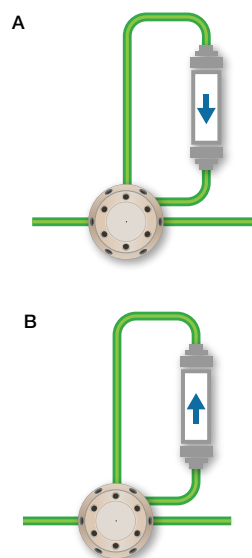
Column Switching Valve

Manual column scouting to determine optimal purification conditions is complicated and time consuming. The NGC Column Switching Valve enables automated column scouting.

Up to five columns can be connected without the need to replumb the system. The valve also includes an internal bypass function for priming or cleaning your system.

When undertaking affinity chromatography, it is desirable to shorten run times and elute concentrated products. The NGC Column Switching Valve has a reverse flow function ideal for rapid elution and sample concentration from affinity columns. This feature also enhances column cleaning and can increase a column's lifetime.

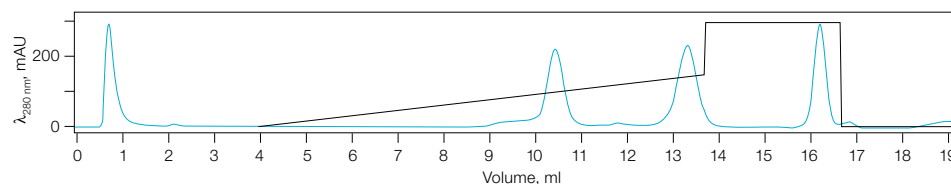
Avoiding column resin damage from compression is an important concern of researchers. The NGC Column Switching Valve has integrated pressure sensors that measure pre-column and delta-column pressures. This protects the column and resin from compression by triggering the pumps to pause or reduce the flow rate.



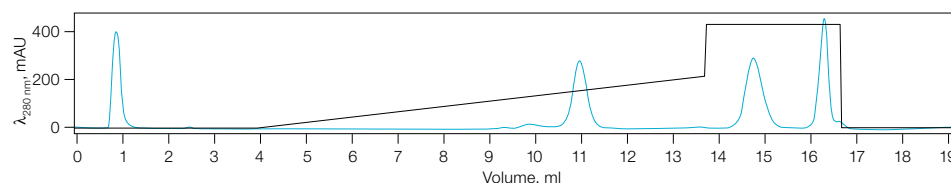
- Automated column/resin scouting
- Connect up to five columns
- Real-time display shows pre- and delta-column pressure
- Reverse flow functionality
- Internal bypass flow path
- Integrated pressure sensors
- Column storage
- Install up to three column switching valves
- Enables tandem and 2-D applications
- Use as a loop valve for Multi-D applications

Fig. 8. A, column switching valve. **B,** column switching valve reverse flow.

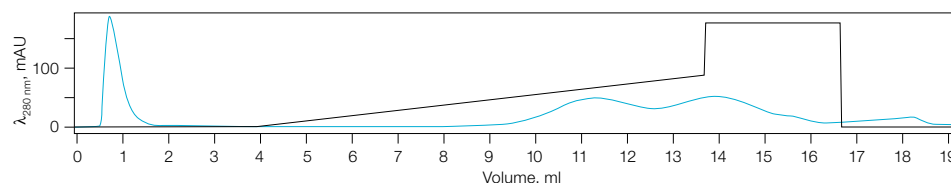
CEX – 8 μm



CEX – 10 μm



CEX – 50 μm



CEX – 70 μm

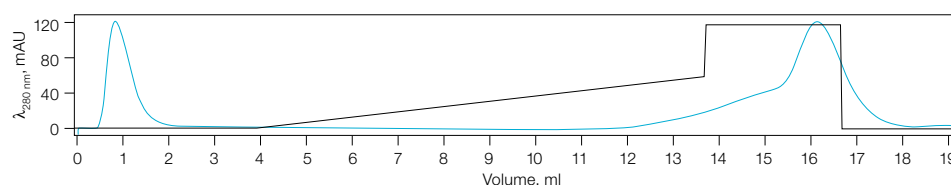


Fig. 9. Automated column scouting using the column switching valve with a cation exchange standard containing α -lactalbumin, ribonuclease A, cytochrome C, and lysozyme in phosphate buffer pH 6.5 separated over four cation exchange (CEX) resin columns of various particle sizes.

Catalog #	Description
7884012	NGC Column Switching Valve Module, 10 ml
7884026	NGC Column Switching Valve Module, 100 ml

SAMPLE MONITORING AND FRACTION COLLECTION

Single- and Multi-Wavelength Detectors

Whether you are running simple protein separations or purifying complex biological samples, you need accurate detection and buffer conductivity monitoring.

The NGC Single- (UV) and Multi-Wavelength (UV/Vis) Detector Modules provide highly accurate detection of biomolecules. Both are combined with an integrated conductivity monitor (0.01 to 999 mS/cm).

The single-wavelength UV detector contains an LED UV light source, with filters for 255 and 280 nm that enable the monitoring of nucleic acids or proteins.

The multi-wavelength UV/Vis detector adds flexibility to your chromatography system by simultaneously monitoring four wavelengths between 190 and 800 nm in a single module and achieving greater sensitivity in the detection of proteins, peptides, nucleic acids, and chromophores.

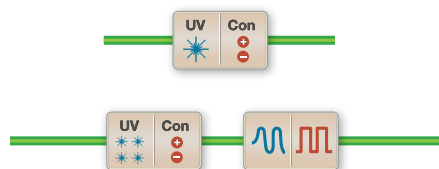


Fig. 10. Single-wavelength detector and multi-wavelength detector with signal import module.

- Integrated conductivity monitor (0.01–999 mS/cm)
- Interchangeable flow cells with 2 mm (preparative), 5 mm (standard analytical), and 10 mm (analytical) path lengths
- Single-wavelength detector (255 or 280 nm)
- Multi-wavelength detector (190–800 nm)

Catalog #	Description
7884008	NGC Single-Wavelength Detector Module
7884009	NGC Multi-Wavelength Detector Module

Signal Import Module

Adding external devices to a purification workflow provides the flexibility to increase automation and the amount of information collected. The NGC Signal Import Module (SIM) enables analog-to-digital signal conversion and connection to third-party devices.

- Enables automated, accurate, and reproducible small- and large-volume sample injection through third-party autosamplers
- Allows you to gather more information about your protein of interest using an external detector

Catalog #	Description
7884016	NGC Signal Import Module

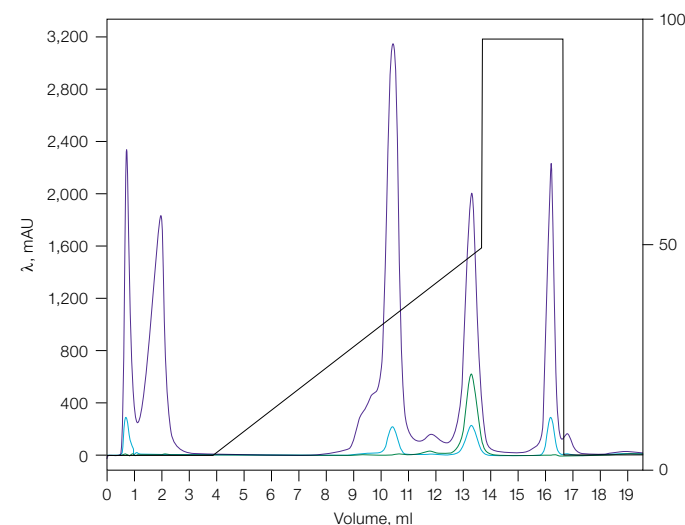
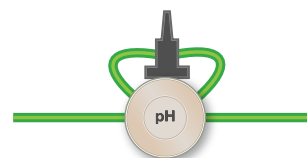


Fig. 11. A cation exchange standard containing α -lactalbumin, ribonuclease A, cytochrome C, and lysozyme was run on a 1 ml ENrich™ S Column at pH 6.5. The NGC Multi-Wavelength Detector was used to simultaneously monitor peptide bonds at 215 nm (—), aromatic rings within protein structures at 280 nm (—), and chromophores at 420 nm (—). This single run provided confirmation of the presence or absence of these compounds before any post-run analysis was performed.

pH Valve Module

The ability to determine and monitor pH is essential for method development and for most purification applications.

The NGC pH Valve Module has an integrated flow cell and pH electrode for accurate inline pH monitoring. It has a bypass mode to take the probe offline without the need for any replumbing.



- Accurate inline pH monitoring (pH 1–14)
- Calibration port for in situ calibration
- Integrated bypass valve
- Reference and pH electrodes sealed in a single body to avoid damage from drying
- Temperature-compensated pH determination

Fig. 12. pH valve.

Catalog #	Description
7884011	NGC pH Valve Module

FRACTION COLLECTION

Researchers require a versatile and easy-to-use fraction collector for their purification needs. The following fraction collection options are compatible with all NGC Systems.

NGC™ Fraction Collector

The NGC Fraction Collector provides automated collection options for analytical and preparative chromatography applications. As Bio-Rad's premier fraction collector, the NGC Fraction Collector is capable of performing basic to complex fraction collection schemes and can be used at flow rates up to 200 ml/min. It supports numerous rack and tray combinations, from microplates and tubes to bottles and carboys.

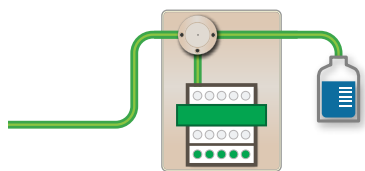


Fig. 13. NGC Fraction Collector.



- Enables multi-user support with increased capacity to accommodate multiple racks for multivessel collection
- Maintains integrity of fractions with Peltier cooling
- Achieves production batch capacity by collecting up to 80 unlimited volume fractions
- Supports flow rates up to 200 ml/min
- Allows accurate vessel positioning down to millimeter precision using factory programmed firmware
- Collect with two NGC Fraction Collectors or one NGC Fraction Collector and the BioFrac™ Fraction Collector
- Gain added versatility when used in conjunction with up to two 12-port outlet valves

FRACTION COLLECTION

BioFrac™ Fraction Collector

The BioFrac Fraction Collector is ideal for both small- and large-scale preparative chromatography applications.

It offers flexible collection rack options, including 4 x 96-well plates, 0.5–2.0 ml microtubes, larger-volume tubes ranging in diameter from 12 to 20 mm, and preparative racks for collection in bottles.

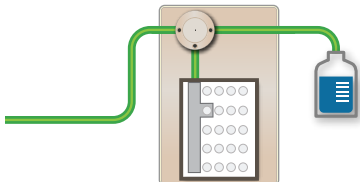


Fig. 14. BioFrac Fraction Collector.

- Ideal for small- and large-scale preparations
- Versatile sample collection capability from 96-well plate to 20 mm diameter tubes
- Stand-alone operation
- Added versatility when used in conjunction with up to two 12-port outlet valves



Outlet Valve

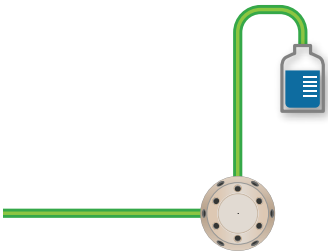
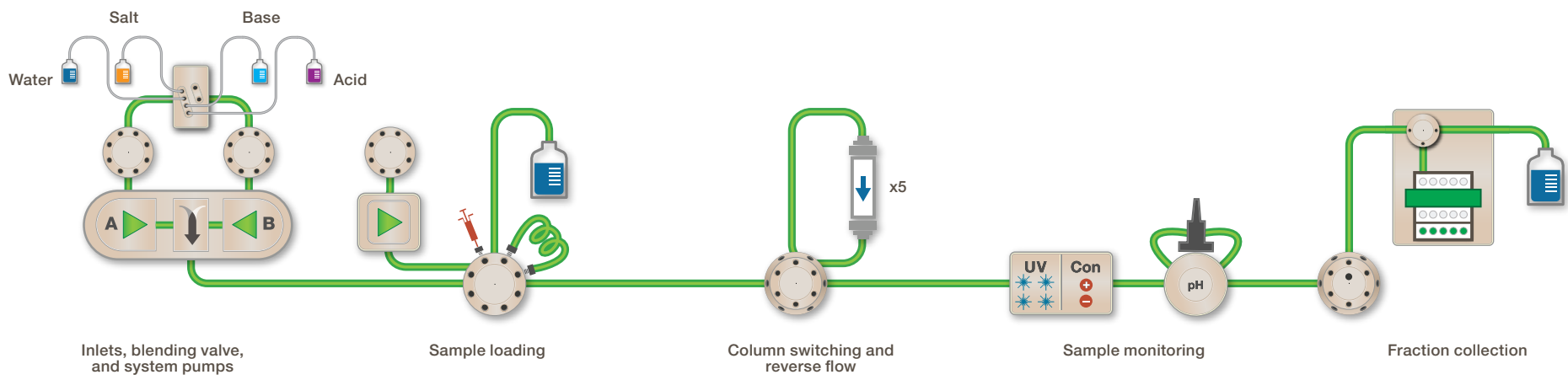














Fig. 15. Outlet valve.

- Collect up to 12 large-volume fractions with single valve
- Collect up to 23 large-volume fractions with two valves
- Collect variable fraction sizes with the BioFrac Fraction Collector
- Connect up to two fraction collectors to the NGC System

Catalog #	Description
17002070	NGC Fraction Collector
7410002	BioFrac Fraction Collector
7884013	NGC Outlet Valve Module

CONFIGURE YOUR NGC SYSTEM



 <input type="checkbox"/> 10 ml/min pumps <input type="checkbox"/> 100 ml/min pumps	 <input type="checkbox"/> Sample pump module	 <input type="checkbox"/> Column switching module Quantity _____	 <input type="checkbox"/> Single-wavelength detector	 <input type="checkbox"/> NGC Fraction Collector
 <input type="checkbox"/> Inlet valve module (buffer) Quantity _____	 <input type="checkbox"/> Inlet valve module (sample) Quantity _____		 <input type="checkbox"/> Multi-wavelength detector	 <input type="checkbox"/> BioFrac Fraction Collector
 <input type="checkbox"/> Buffer blending module			 <input type="checkbox"/> pH valve module	<input type="checkbox"/> Outlet valve module Quantity _____
			 <input type="checkbox"/> Signal import module	
Module Selection Table				



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