GINKGO BIOWORKS

Benchtop Reconfigurable Automation Cart (RAC)

Benchtop Lab Automation Systems

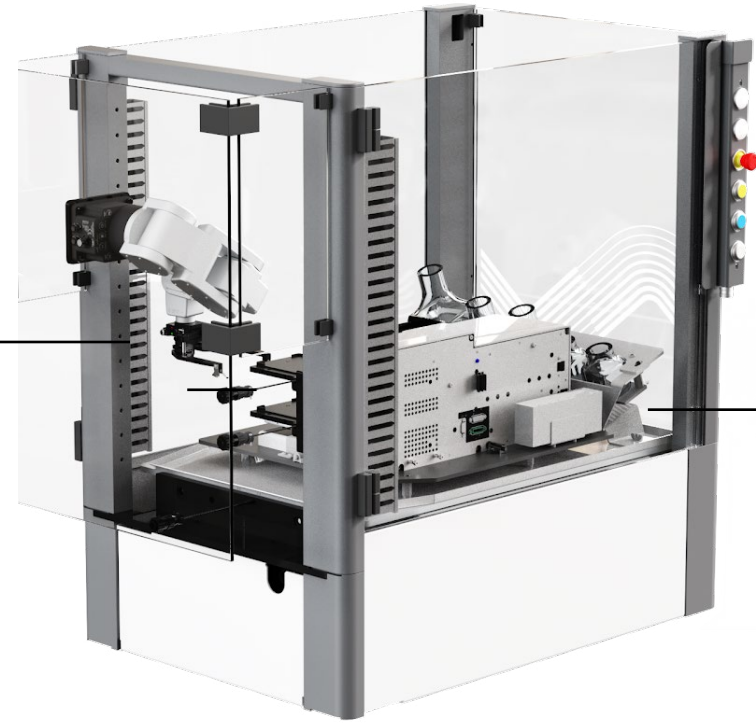
ENABLES:

High walkaway time

High uptime

High-throughput experimentation

DOWNLOAD



Small footprint, scalable automation solutions for dynamic and high-mix workflow environments.

Benchtop RACs are small footprint, scalable automation solutions for dynamic and high-mix workflow environments. They enable high walkway time, high uptime, and high throughput experimentation.

Benchtop RACs have a small footprint that enables deployment in anaerobic chambers, BSL, and similar environments.

Each Benchtop RAC includes:

- Lab instrument(s) of choice
- Dedicated robotic arm
- Plate transport track
- Standard utility connections

Individual units combine to create systems capable of performing numerous lab operations.

Add more Benchtop RACs to add more unit operations. Add redundant Benchtop RACs to manage bottlenecks in processes and to increase throughput.

Protocols are developed to execute experimental workflows. Different workflows can be run dynamically at one time, by different operators, with different parameters.

Changing parameters within a developed workflow (e.g. shake time) is straightforward. Ginkgo's automation services include hardware (RACs and Benchtop RACs), Catalyst software (Orchestrator, Data, and Agent), and Apex Support for remote, ticketless support, reducing and in some cases eliminating the need for dedicated automation FTEs.

Off the shelf instrumentation integrations

Storage
HighRes Bio TundraStore D
HighRes Bio AmbiStore D
HighRes Bio SteriStore D
HighRes Bio MicroServe
LiCONiC LPX 110

Incubation
Thermo Fisher Cytomat 2
Inheco Single Plate Incubator

Bulk Dispensing
Agilent BioTek MultifloFX
Agilent 406 FX
Agilent BioTek EL406
Blue Cat Bio BlueWasher

Centrifugation
BioNex Solutions HiG3/4
HighRes Biosolutions Microspin

Colony Picking
Singer Instruments PIXL

Liquid Handling
Formulatrix Flo i8
Agilent Bravo
Beckman Echo 5xx/6xx
Formulatrix Tempest

Thermal Cycling
Thermo Fisher ATC
BioRad Laboratories Opus

Flow Cytometry
Thermo Fisher Attune Cytpix

High-content imaging
Araceli Biosciences Endeavor

HPLC
Waters ACQUITY

Sealing
Azenta a4s
Agilent PlateLoc

Barcoding
Agilent VCode

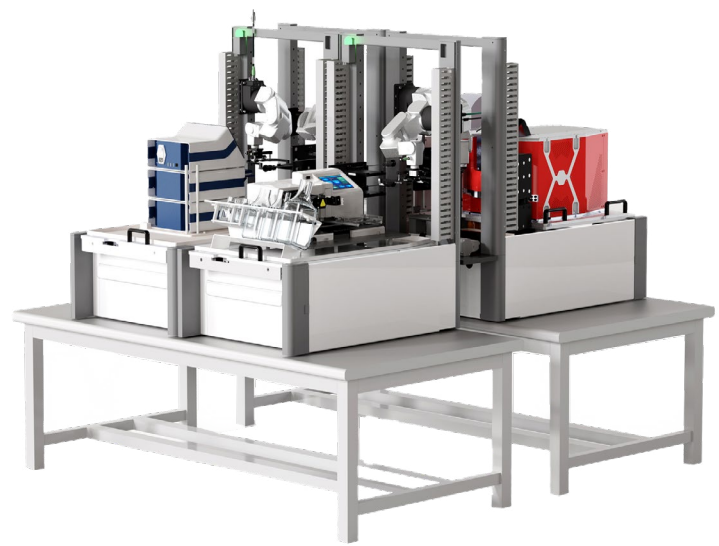
Peeling
Azenta XPeel

Plate Reading
BMG Labtech PHERAstar
Tecan Spark
Molecular Devices SpectraMax i3x

Shaking
QInstruments BioShake 3000/5000/D30

Transfection
Lonza Nucleofector96

Capping/decapping
Azenta IntellixCap96



New instrumentation is onboarded regularly.
Additional lab instrumentation can be onboarded to customer systems as requested.

Features comparison: RACs and Benchtop RACs

RACs

Benchtop RACs

	RACs	Benchtop RACs
Reconfigurability	High Minimal/no tools required; no special equipment (lifts)	Medium Requires tools, may require special infrastructure (like lift tables) depending on options selected
Units combine to make larger systems	+100s	<15
Modularity	High	Medium
Expandability	High	Medium
Equipment integration optionality	High	Medium
Optional HEPA filter	✓	
Quick connection points for easy assembly	✓	
Dedicated robotic arm	✓	✓
Height	Medium	Varies, depending on options selected
Plate transport track	✓	✓
Standard utility connections	✓	✓
Optimal ergonomics	✓	Varies, depending on options selected
Supports protocol building	✓*	✓*
Bespoke environments (BSL, Anaerobic, Solvents, etc.)		Options available from partnered 3rd party enclosure suppliers
Compatible with uneven floors	✓	✓
Compatible with ACS	✓	✓
Compact form factor		✓ Enables use in controlled environments like anaerobic chambers, fume hoods, etc.
Stackable (for high density installations)		✓

Exemplary Applications

Genetic Engineering/Synthetic Biology

- generic DNA amplification (PCR)
- “DNA parts” amplification
- colony PCR
- in vitro / in vivo DNA assembly
- in vitro transcription
- restriction digestion
- rolling circle amplification
- microbial cell heat-shock transformation
- microbial cell electroporation
- mammalian cell chemical transfection
- mammalian cell nucleofection

Nucleic Acid / Protein Purification

- magnetic bead-based purification
- filter plate-based purification
- microchromatography tip-based purification
- UV-Vis spectrophotometry-based quantification
- fluorometry-based quantification

Analytical Chemistry

- HPLC-based sample analysis

NGS Library Preparation

- enzymatic DNA fragmentation / tagmentation
- DNA ligation of adapters
- RNA to DNA reverse transcription
- target enrichment
- indexing PCR

Cell Culture Handling

- cell culture cryopreservation
- cell culture inoculation
- cell culture passaging
- protein-expression induction
- cell culture plating
- cell culture enzymatic / chemical lysis
- colony picking
- optical density measurements

Generic Labware / Sample Handling

- bulk microplate prep (barcoding, bulk dispensing etc.)
- stamping liquid handling rearray
- cherry picking liquid handling rearray
- sample serial dilution or normalization

High-throughput Assays

- plate reader-based assays:
  - ELISA assays
  - AlphaLISA assays
  - HTRF assays
  - HiBiT assays
  - enzyme kinetics assays
  - ADME pharmacokinetics assays
- qPCR-based assays:
  - gene expression profiling
  - genotyping
  - rAAV titering
  - thermal shift assays
- flow cytometry-based assays:
  - cell proliferation assays
  - cell viability / apoptosis assays
- high-content imaging-based assays:
  - cell proliferation assays
  - cell differentiation assays
  - cell viability / apoptosis assays
  - cytotoxicity assays

* List is not exhaustive