



## **Liberty™ 2.0 Series**

Automated Microwave Peptide Synthesizers



Introducing the Liberty 2.0 series (Liberty™ 2.0, Liberty Blue™ 2.0, and Liberty PRIME™ 2.0) of automated microwave peptide synthesizers. Released in 2022, this new generation of systems builds on the award winning High-Efficiency SPPS (HE-SPPS) methodology and instrumentation previously used with CEM's best-selling Liberty Blue system.

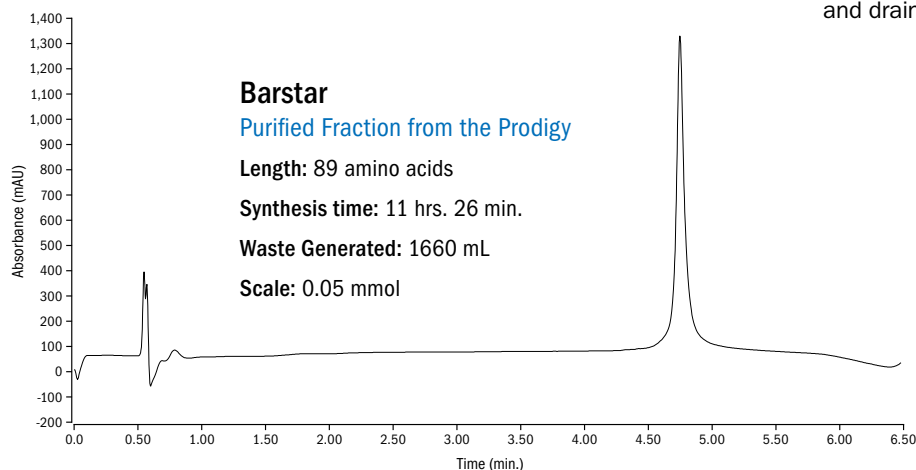
The Liberty 2.0 Series feature significant advancements in peptide quality, robustness, and overall flexibility compared to the previous generation. A major advancement featured on the Liberty Blue 2.0 and Liberty PRIME 2.0 systems is the use of a new Headspace Flushing technology allowing for the synthesis of longer peptides by ensuring cleaner reaction vessel surfaces. Additionally, engineering improvements to the overall system fluidics and software provide increased robustness and flexibility. Learn more about the exciting updates to the most advanced peptide synthesizer line available.



# Improved Peptide Quality

The Liberty Blue 2.0 and Liberty PRIME 2.0 provide the ability to make even higher purity peptides than previously possible with their respective predecessors. This is based on advances in the system fluidics, reaction vessel environment, and chemistry methodology.

- Optimized chemistry methodology with ProTide resins.
- Cleanest reaction environment with updated headspace flushing technology.
- More direct optimized flow paths.
- Digitally variable N<sub>2</sub> control for optimized bubbling, purging, and draining.



# Increased Reliability

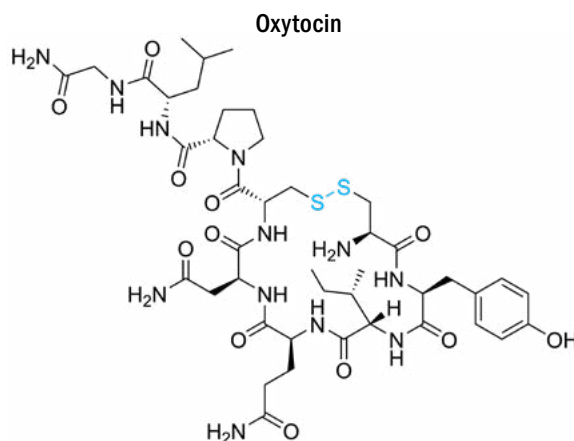
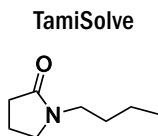
All Liberty 2.0 level systems feature more direct and cleaner flow paths. The result is a new level of robustness providing higher runtime with less downtime even under high usage conditions.



# Ultimate Flexibility

You can do almost anything with the Liberty 2.0 series.

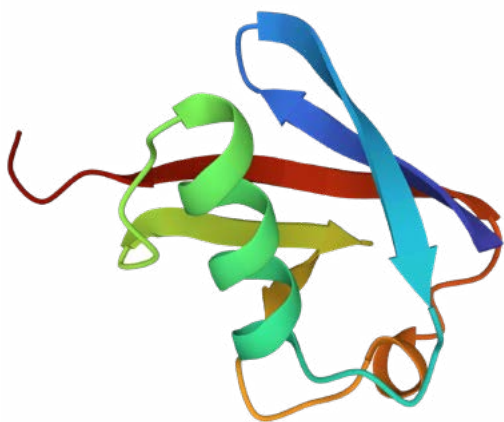
- Access a wide scale range from 5  $\mu$ mol – 5 mmol.
- Wider pressure range for accessing viscous green solvents (TamiSolve).
- Automate synthesis of complex steps and more.



# Robust Engineering. Optimized Chemistry.

Protein synthesis on the Liberty PRIME 2.0 demonstrates the enhanced performance of the 2.0 series to synthesize very long peptides and even small proteins. The combination of the chemical methodology developed by CEM with the engineering improvements of the new 2.0 series push the limits of chemical synthesis.

**Ubiquitin**

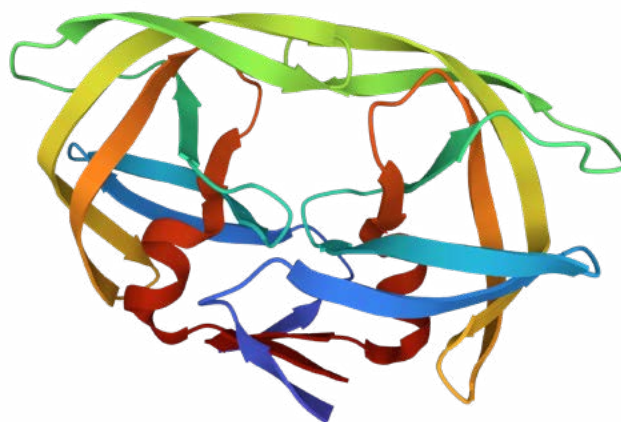


**Length:** 76 AA

**Synthesis time:** 9 hrs. 35 min.

**Resin:** ProTide

**HIV Protease**

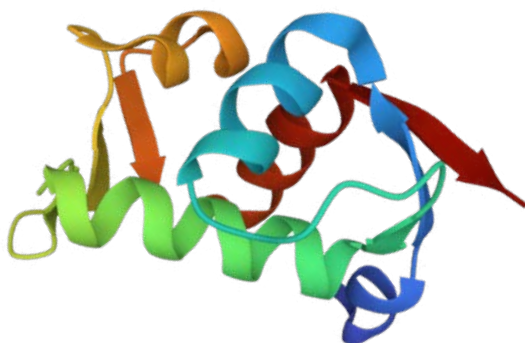


**Length:** 99 AA

**Synthesis time:** 12 hrs. 48 min.

**Resin:** ProTide

**MDM2**



**Length:** 118 AA

**Synthesis time:** 16 hrs. 26 min.

**Resin:** ProTide

**Collagen Like Peptide**



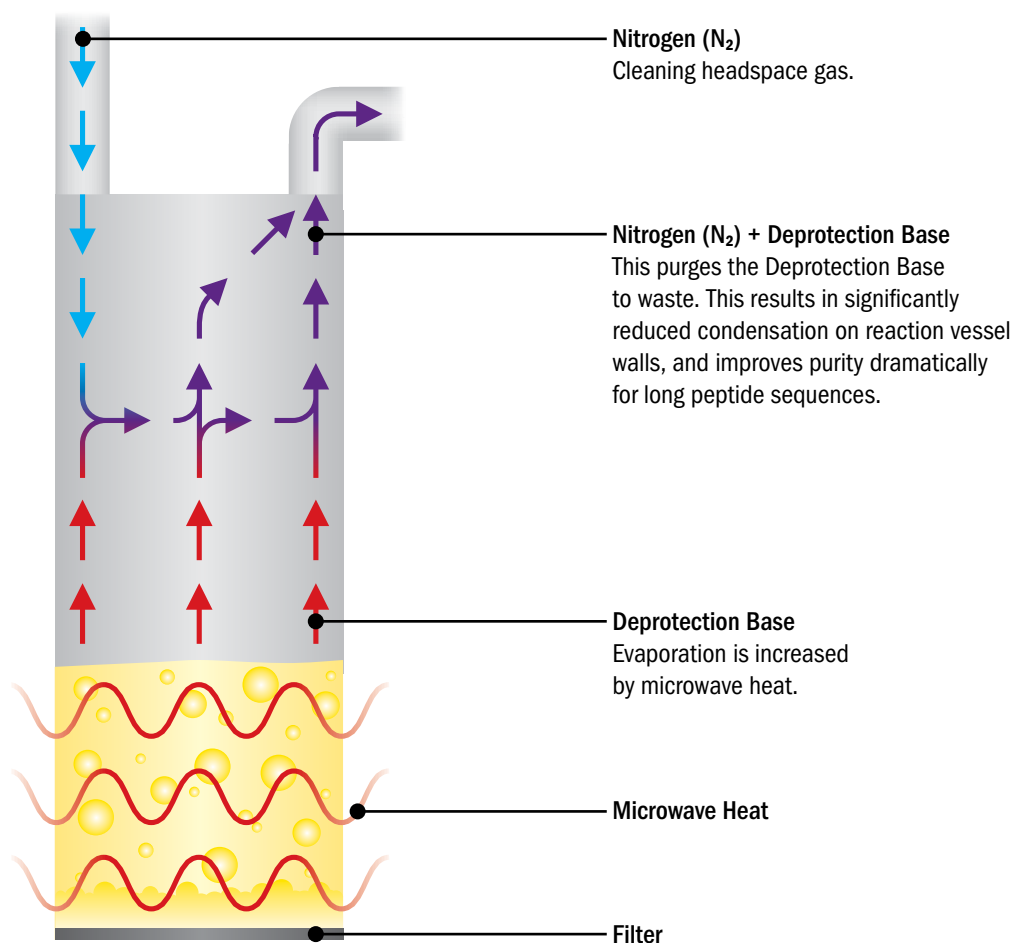
**Length:** 99 AA

**Synthesis time:** 12 hrs. 30 min.

**Resin:** ProTide

# Headspace Flushing — Cleaner Reaction Vessel Surfaces

A new feature with the Liberty Blue 2.0 and Liberty PRIME 2.0 systems is the use of headspace flushing to provide a cleaner reaction vessel surface from volatile deprotection bases at elevated temperature. The use of headspace flushing is beneficial for achieving unprecedented levels of purity for longer sequences.



**Note:** Headspace flushing technology is utilized on the Liberty Blue 2.0 and Liberty PRIME 2.0 systems

# Find Your Automated Needs

All Liberty synthesizer models give you access to:

- Fast, Flexible, High-Purity Synthesis
- Synthetic Biomolecules
- Alternative Solvents
- Complex side-chain functionalization, cyclization, and branching
- High-throughput synthesis
- Less Waste

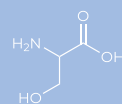
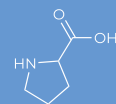
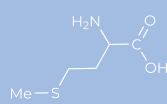
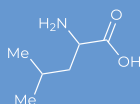
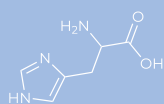
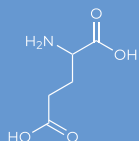
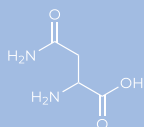
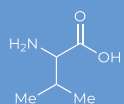
	<b>Liberty 2.0</b>	<b>Liberty Blue 2.0</b>	<b>Liberty PRIME 2.0</b>
			
<b>Cycle Time</b> (at 0.1mmol)	12 minutes	4 minutes	2.5 minutes
<b>System Waste</b> (at 0.1mmol)	32 mL	16 mL	10 mL
<b>Scale Range</b>	0.005 – 5 mmol	0.005 – 5 mmol	0.005 – 5 mmol
<b>Headspace Flushing</b>	No	Yes	Yes
<b>Amino Acid Positions</b>	27	27	30
<b>External Reagent Positions</b>	4	4	5
<b>RV Camera</b>	No	Yes	Yes
<b>LED Visual Feedback</b>	No	Yes	Yes
<b>High-Throughput Options</b>	HT4	HT4, HT12	HT4, HT12, HT24
<b>Optional Accessories</b>	N/A	N/A	Full cGMP Compliance Package

## Liberty PRO

Easily scale up peptides optimized on any Liberty 2.0 series system. The Liberty PRO™ allows for fully automated, production scale, microwave peptide synthesis under cGMP using a 3, 8, or 15 liter reaction vessels. Batch crude peptides up to 1 kg can be synthesized with a typical cycle time of 15 – 45 min per amino acid.

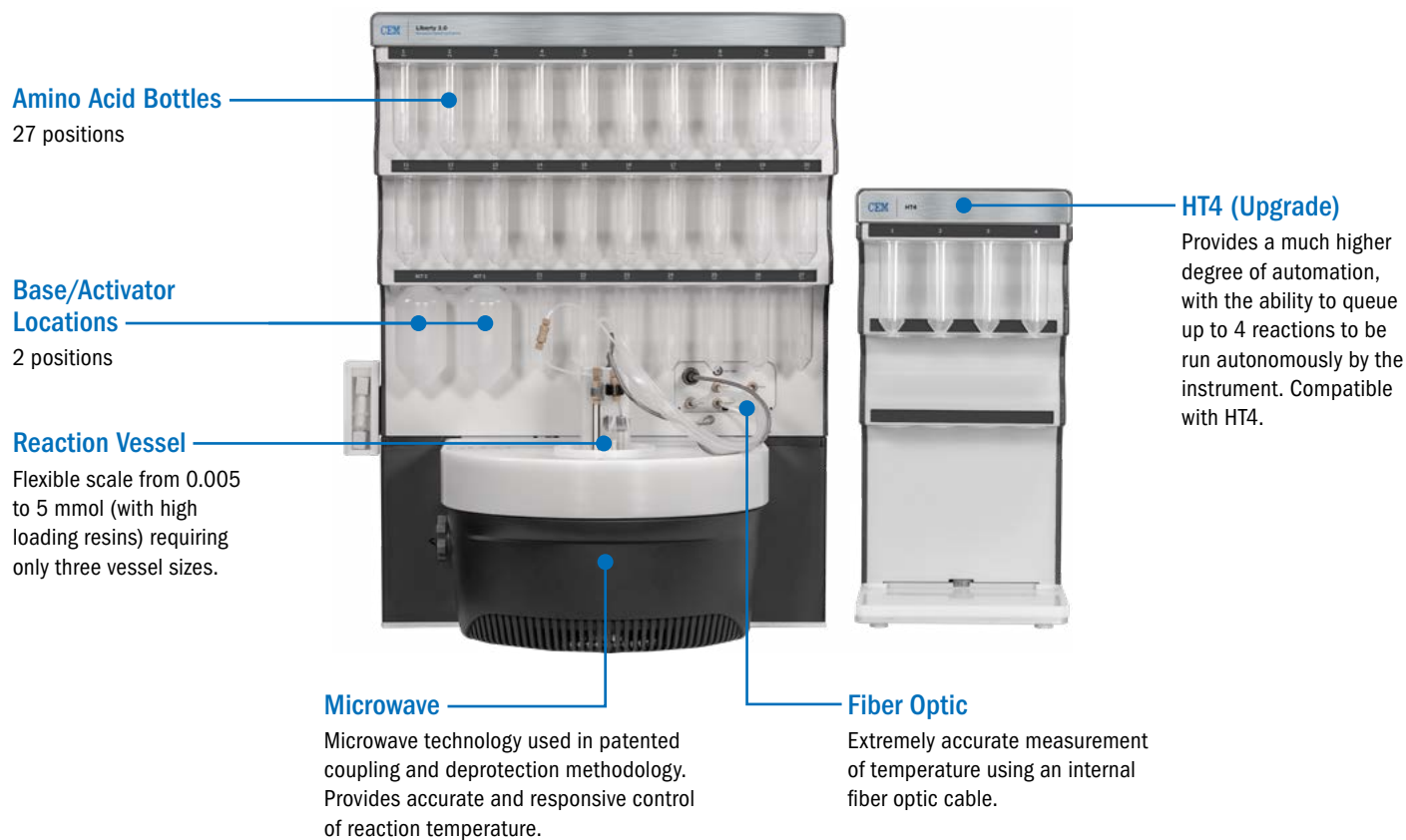






# A Powerful Peptide Synthesizer

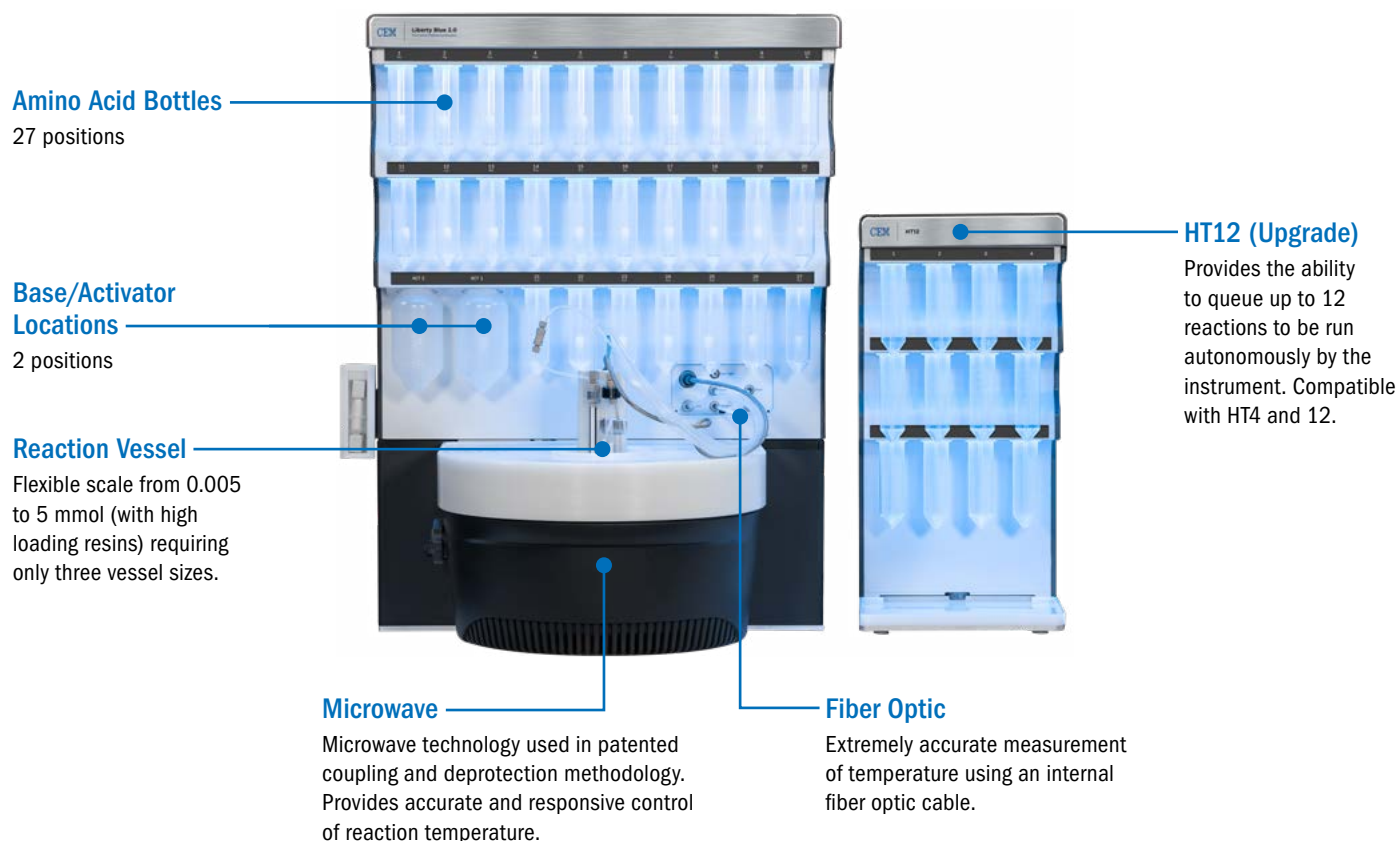
The entry-level system for CEM's best in class microwave peptide synthesizer line. The Liberty 2.0 provides advantages over existing peptide synthesizers with its patented use of microwave irradiation during both the deprotection and coupling steps (15 minute cycle times), in-situ temperature control, Flex-Add™ delivery system, and efficient solvent usage.





# Synthesize Peptides with High Efficiency

The Liberty Blue 2.0 is the exciting next generation of the best-selling peptide synthesizer in the world. Compared to its predecessor, the Liberty Blue 2.0 features the ability to make cleaner and longer peptides with a new level of robustness. The system features a 4-minute cycle time along with a 90% solvent reduction based on High Efficiency Solid Phase Peptide synthesis (HE-SPPS). The Liberty Blue 2.0 features the latest in engineering for fluidic deliveries, true internal temperature feedback control, and software control with 21 CFR Part 11 compliance.

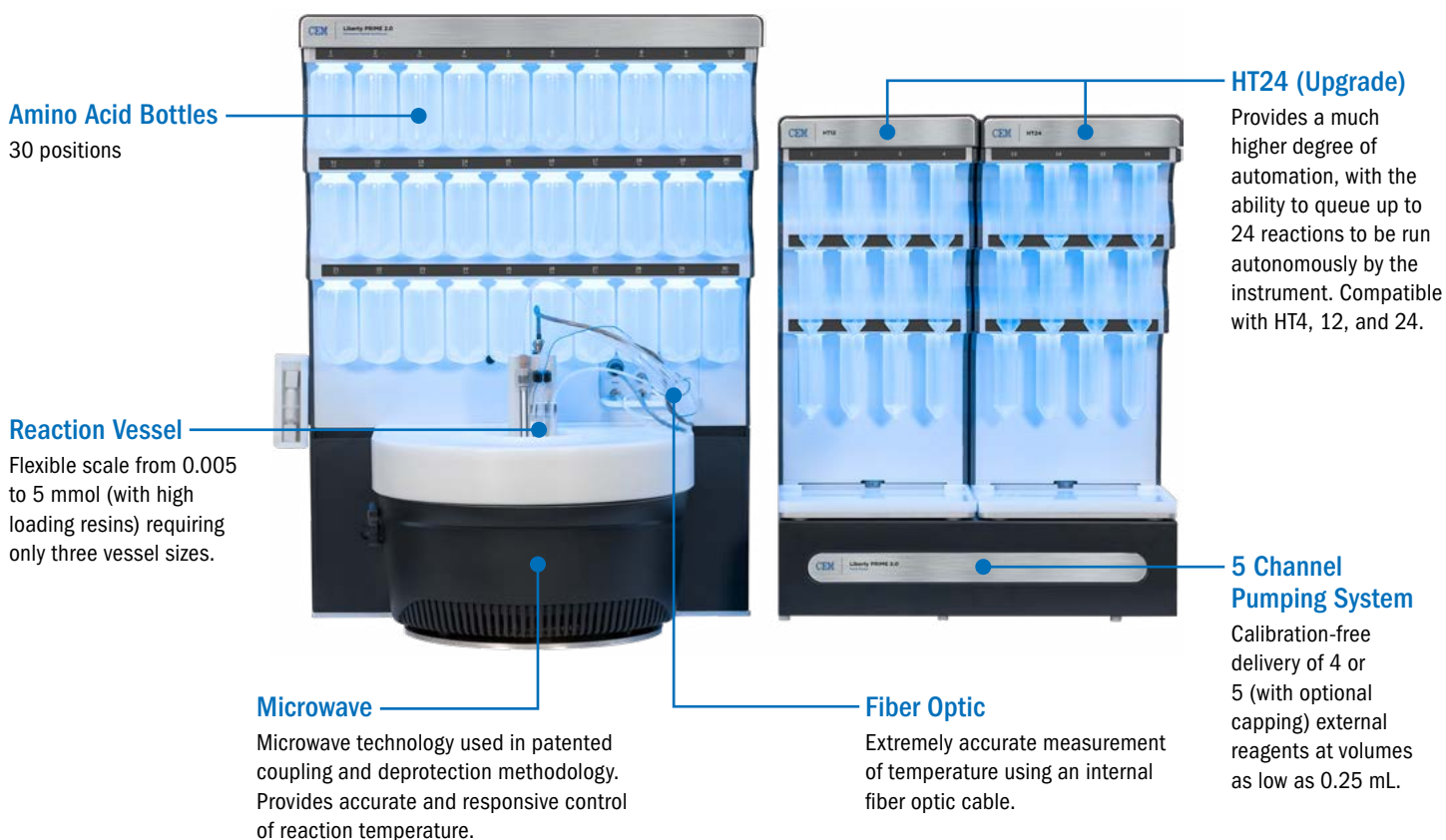


# Unparalleled Speed and Efficiency

The Liberty PRIME 2.0 is the absolute best peptide synthesizer available in the world. The system features a unique one-pot deprotection and coupling process allowing for a remarkable 2 minute cycle time with only 8.5mL waste per cycle (at 0.1mmol). A key improvement in the 2.0 version of the Liberty PRIME is the ability to make cleaner and longer peptides with a new level of robustness than previously possible.

The Liberty PRIME 2.0 provides the ultimate flexibility for long, difficult, or complex peptides. Additionally, the system provides an ultra-fast sequential synthesis workflow that can dramatically outperform traditional parallel peptide synthesizers. The Liberty PRIME 2.0 can be utilized in cGMP peptide production.

- Massive reduction in solvent and deprotection usage.
- Dramatically faster deprotection step because the reaction mixture remains at high temperature.
- Shorter overall cycle time due to the removal of the post-coupling draining step.

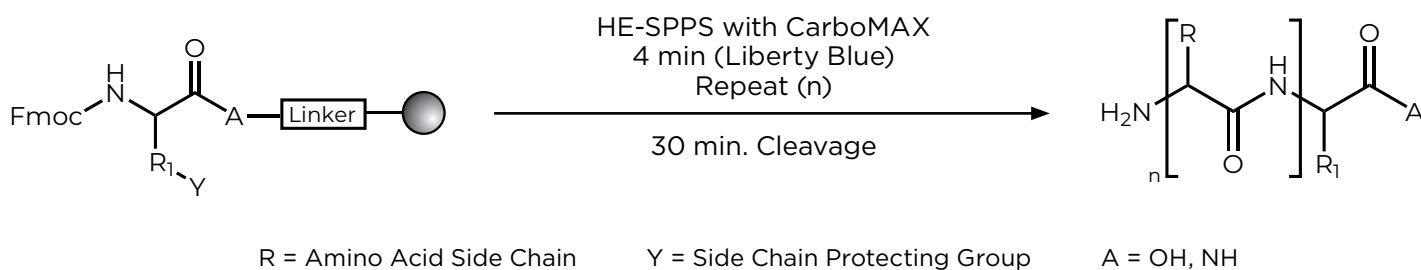






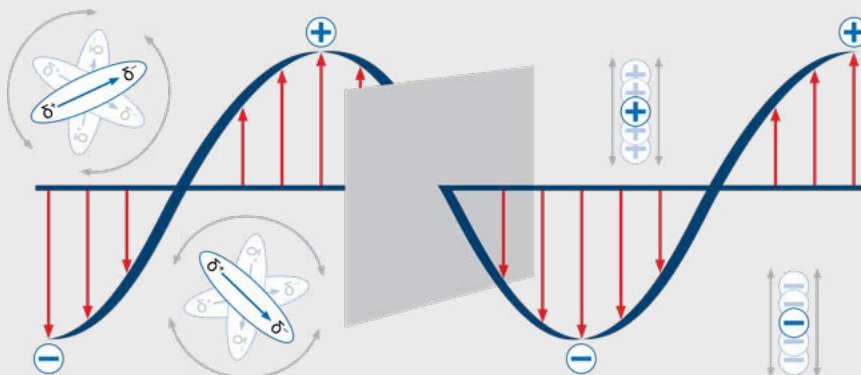
# The Most Powerful Partnering of Chemistry and Engineering

The Liberty 2.0 series, like preceding models, utilizes CEM's High-Efficiency Solid Phase Peptide Synthesis (HE-SPPS) and CarboMAX coupling methodologies.



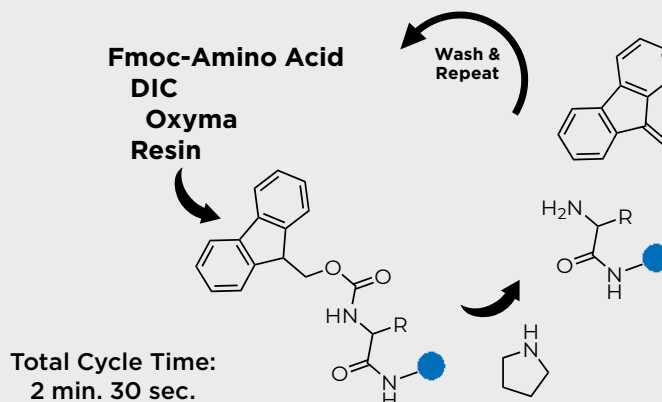
## Pioneers in Microwave SPPS

- Rapid, responsive heating
- Energy efficient
- Optimized methodology for high speed and purity



## One-pot Coupling/Deprotection

CEM's recently developed one-pot coupling/deprotection methodology provides unparalleled simplicity and efficiency, specifically featured on the Liberty Prime 2.0.

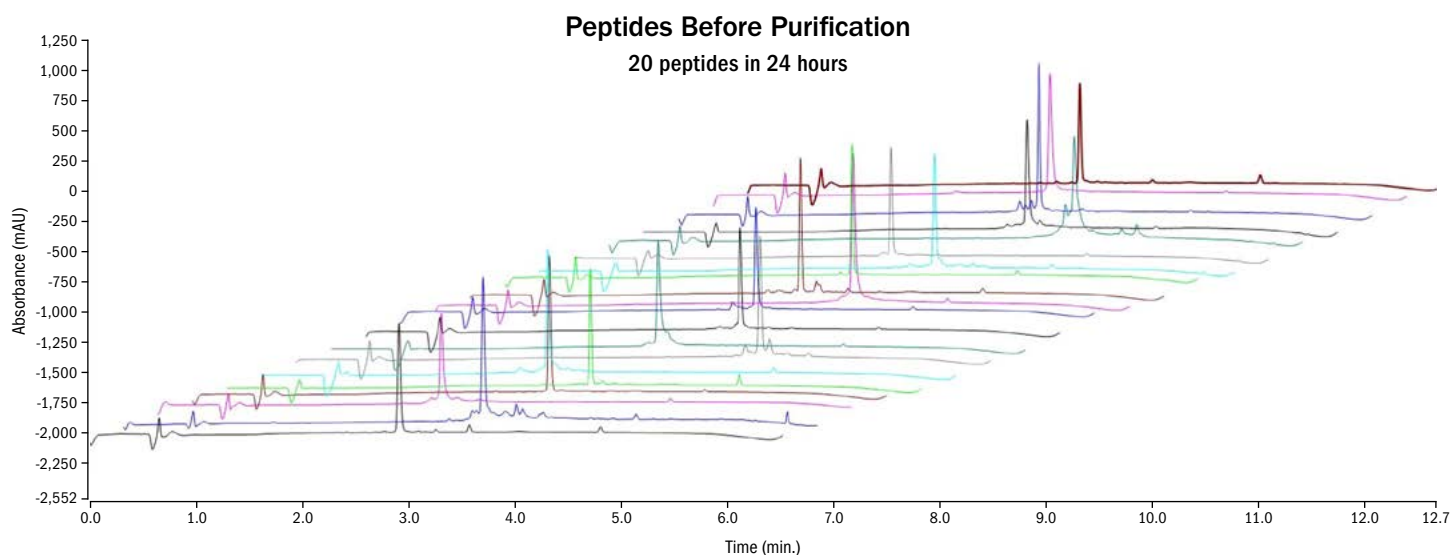






# Automated High Throughput Production

The Liberty series of instruments enable high throughput peptide synthesis with high purity. Optional High-Throughput modules allow for running automated batch sizes of 4 (HT4), 12 (HT12), or 24 (HT24) peptides on a Liberty 2.0 series system.



Sequence	Crude Purity	Final Purity*	Recovery (%)	mg
GWVKPIIGHHAYGDQYRAT	73	99.1	61	103.2
TLYEQEIEV	49	94.5	68	39.7
HGSRKNITDMVEGAKKANG	73	91.7	57	91.1
SLLNQPKAV	79	99.7	46	35.0
EDPYLFELPVLYLDMGTT	76	98.5	68	38.4
ALAVLSNYDA	84	99.3	13	11.4
TMEDKIYDQQVTKQCLCF	47	97.1	44	47.2
YSYPETPLYMQTASTSYE	47	95.2	26	29.7
KVGYTEQRWDFLSEASIM	61	97.3	44	63.2
RLRMREHMMKNVDNQNQD	65	96.3	51	75.2
VYEKNGYIF	90	98.5	47	54.8
ALAVLCNYDA	73	99.3	45	34.7
ALVPPSKRKMWVVSPEAKA	78	97.1	66	111.2
ISTPTPTIVHPGSLPLHLG	75	99.2	56	81.7
IVQENNTPGTYLLSVSARD	74	96.3	56	89.7
RFHMKVSVYLLAPLREALS	75	96.8	51	88.7
ENLKQNDISAEFTYQTKDA	82	99.3	61	111.5
YMPVNSEV	70	97.8	44	33.3
TNDVKTLDLNGVIEEFT	59	97.6	24	29.9
SAWLFRMWYIFDHNYLKPL	48	99.9	66	79

\*The peptides were purified on the Prodigy to give >90% final purity on all samples.

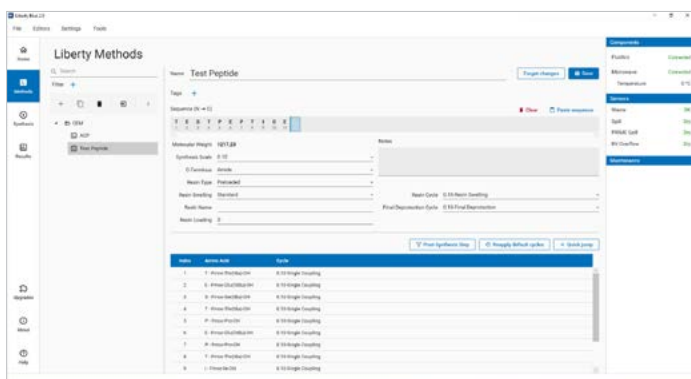
Hilf, N. et al (2019) Nature 565, 240-245.



# Flexible and Powerful Software

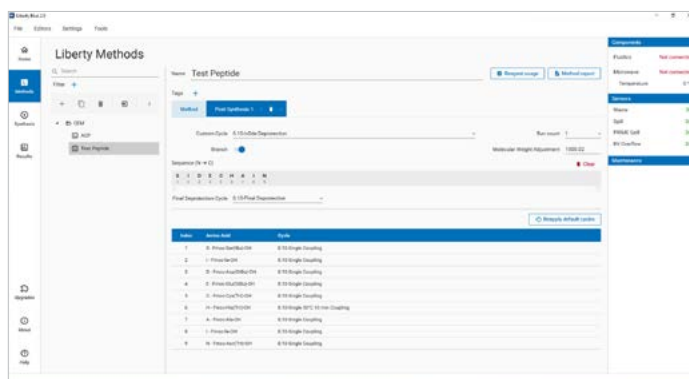
The Liberty 2.0 Series of Peptide Synthesizers feature an updated software system that provides the latest in ease-of-use, flexibility, and conformity with 21 CFR Part 11 compliance. The software allows for simple customization of reagent positions, peptide modifications, and the ability to edit/stop during a method run.

## Easy and Flexible Sequence Programming



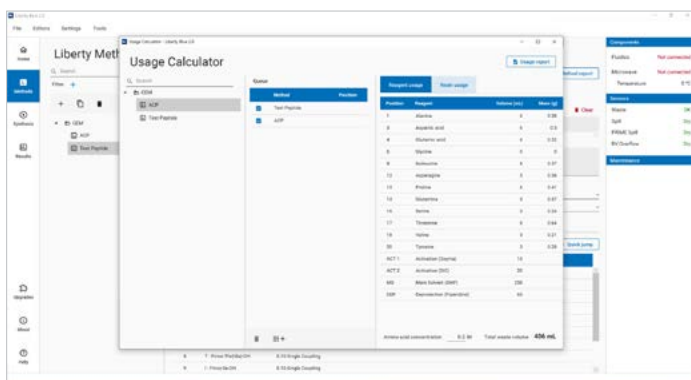
The method editor on the Liberty Blue allows full customization of reaction parameters. Create, edit and store methods to streamline the run process.

## Program Post-Synthesis Modification



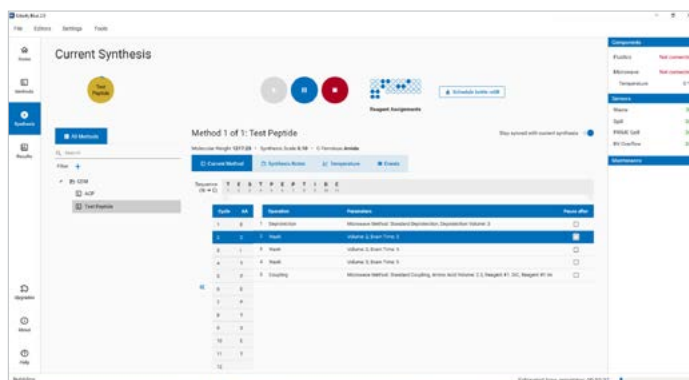
Versatile options for post-synthetic steps like branching, cyclization, orthogonal deprotection, labeling, and more. Empower your chemistry with flexible options.

## Full Suite of Calculator Tools



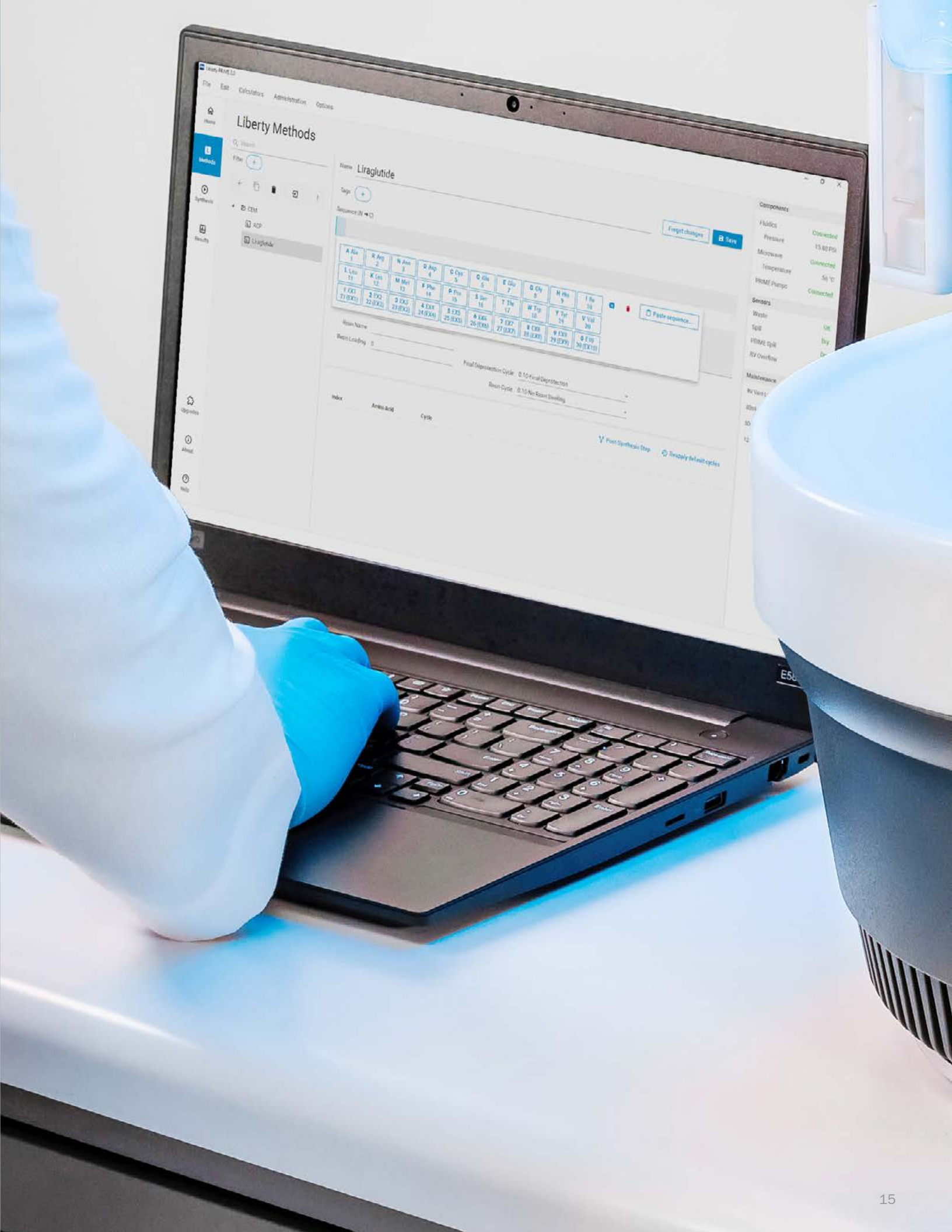
Convenient calculators provide the reagents and amounts for a run, streamlining the process of reaction preparation.

### Edit or Monitor at any Step

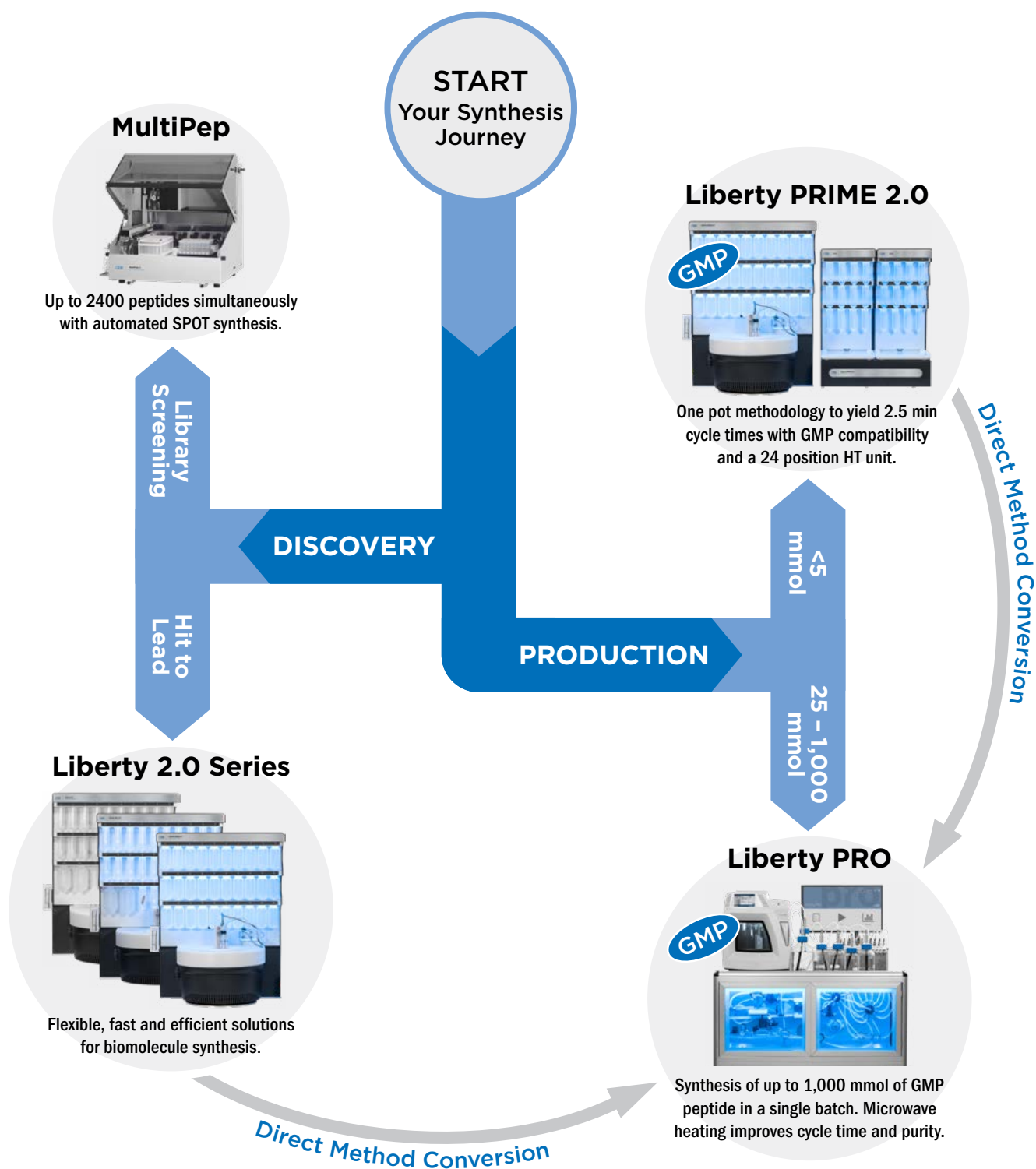


Easily edit and monitor reactions from the run screen. With an HT module, program a queued run, even while a synthesis is in progress.





# We have You Covered from Spot Synthesis to Kilogram Scale Production



### Cleavage

# Razor

The RAZOR® reduces standard cleavage times from 3 – 4 hours down to only 30 min. The system performs cleavage of up to 12 peptide resins at a time with precise temperature control. The system is compact and easily fits in standard fume hoods.



### Purification

# Prodigy

The Prodigy™ Peptide Purification System is a Preparatory HPLC that is specially engineered for peptide purification. It features elevated temperature purification, a focused gradient calculator, and is capable of purifying milligrams to grams of crude peptide — all with modern and easy to use software.





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11 R&D 100 awards.



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