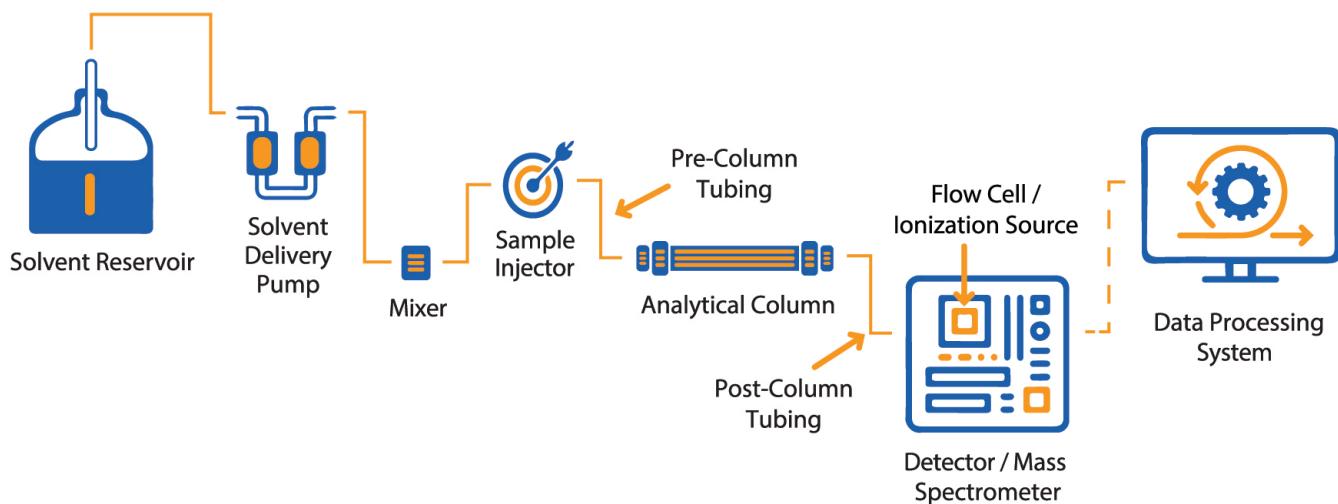


# SYSTEM OPTIMIZATION

Success with smaller ID columns requires attention to optimizing the LC system hardware for best performance. While manufacturers of UHPLC systems in general have already reduced system volumes, consideration should be taken to items like tubing and flow cells which lead to extra column dispersion.

Most critical when changing a gradient method from a current column to the new 1.5 mm ID column is the system dwell volume and extra column dispersion. The dispersion occurs post column in the tubing leading to the detector and within the detector itself. Under isocratic conditions, the dispersion comes from both pre- and post-column tubing as well as injection volume and detector.

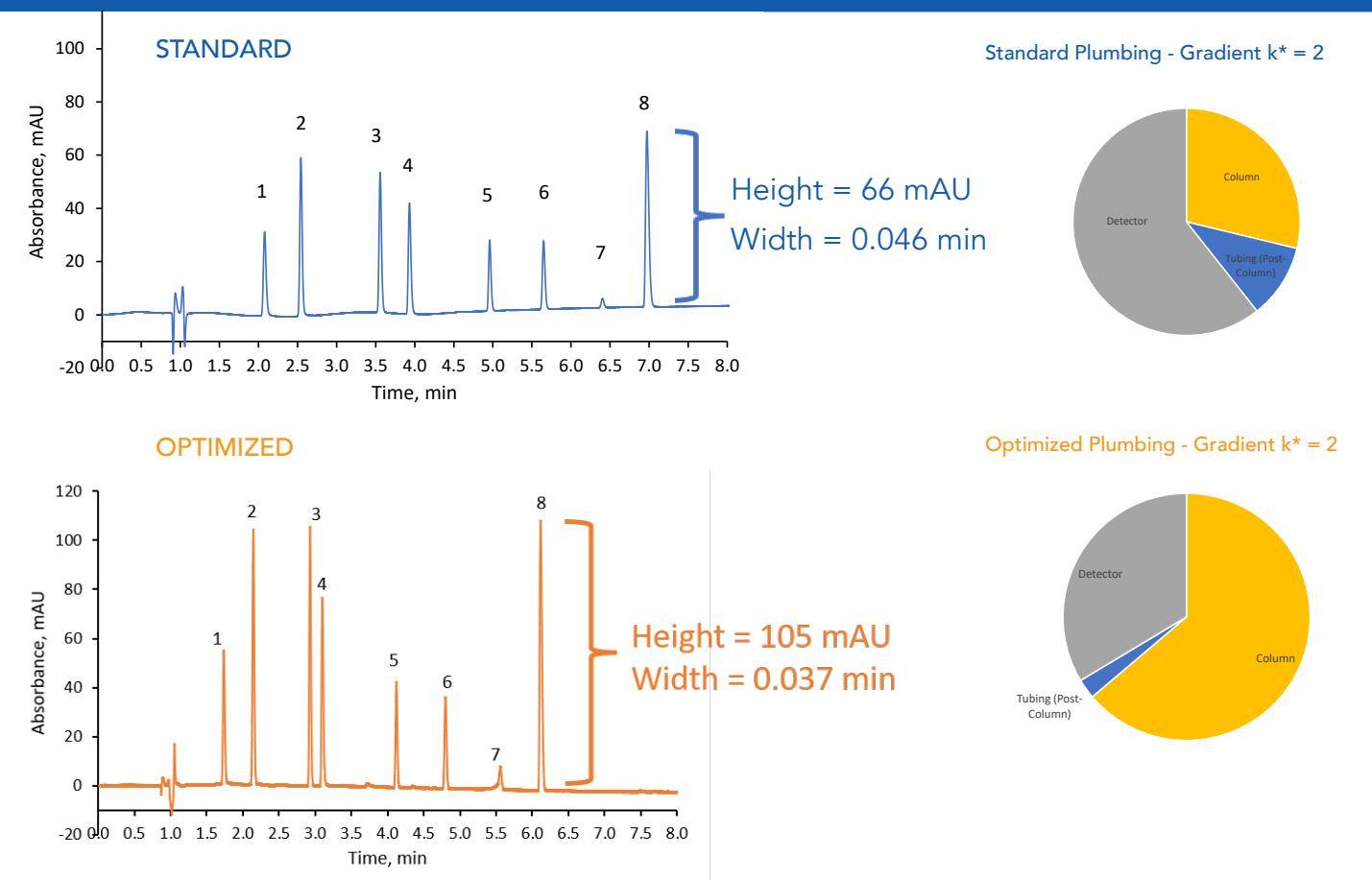


## EXAMPLE DEMONSTRATING REDUCTION OF UHPLC VOLUMES

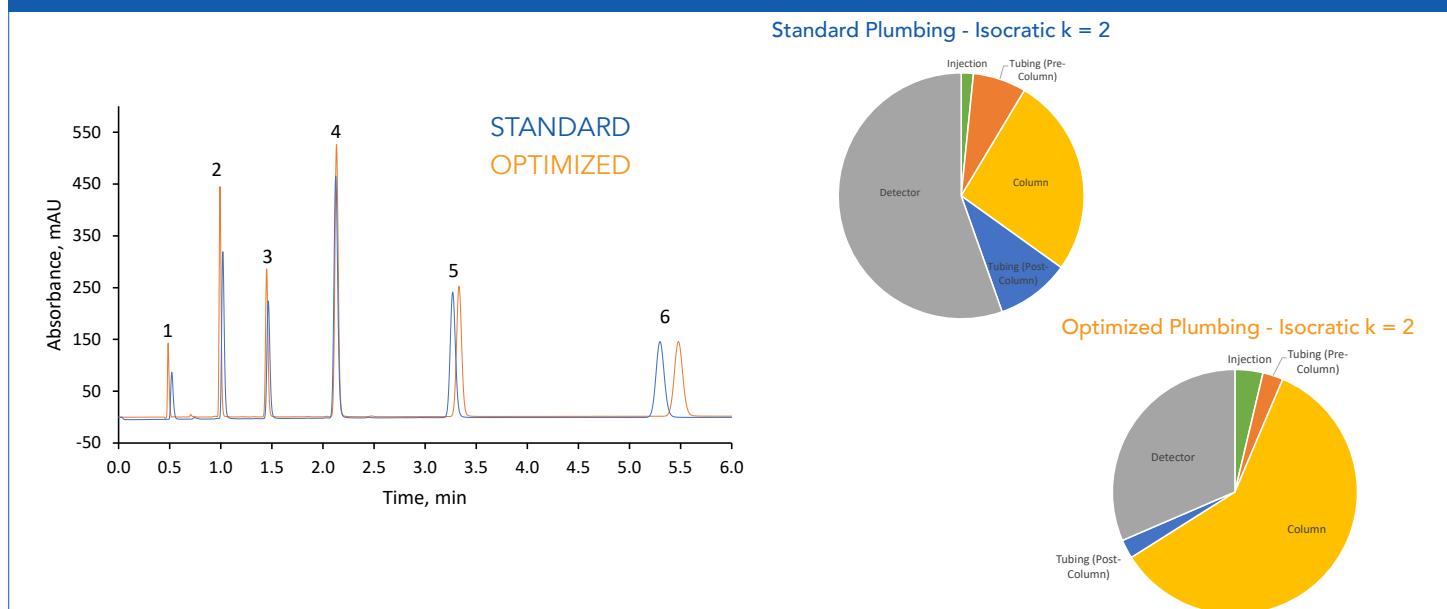
COMPONENT	STANDARD UHPLC SYSTEM	OPTIMIZED UHPLC SYSTEM
Mixer ( $\mu\text{L}$ )	100	20
Pre Column Tubing Volume ( $\mu\text{L}$ )	0.1 mm x 800 mm 6.3	75 $\mu\text{m}$ x 350 mm 1.5
Post Column Tubing Volume ( $\mu\text{L}$ )	0.1 mm x 509 mm 4	60 $\mu\text{m}$ x 707 mm 2
Flow Cell (PDA) Volume ( $\mu\text{L}$ )	1	1
Extra Column Dispersion ( $\mu\text{L}^2$ )	14	2

## COMPARISON OF STANDARD TO OPTIMIZED SYSTEM CONFIGURATION FOR OTC COUGH AND COLD MEDICINES

When the UHPLC is optimized, peak heights are taller and peak widths are smaller, leading to improved sensitivity. Notice how the pie wedges for the post-column tubing and the detector are reduced in size when the UHPLC system is optimized for this gradient separation.



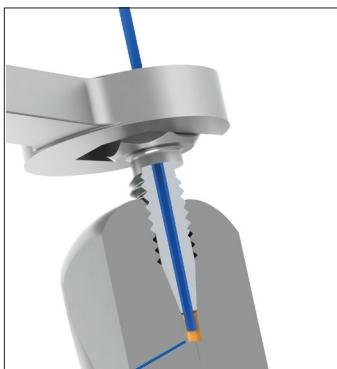
Using isocratic conditions, the extracolumn dispersion comes from both pre- and post-column tubing, the injection volume, and the detector. In this comparison the peaks are taller and the peak efficiencies are increased with the optimized UHPLC system.



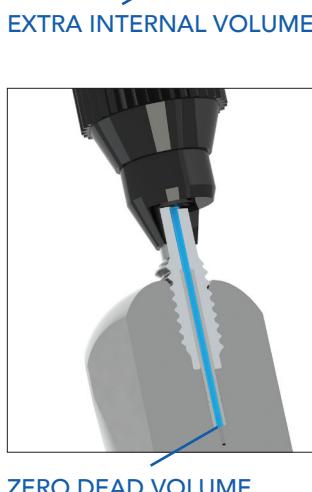
# ENSURE A PERFECT CONNECTION WITH MarvelXACT™

MarvelXACT™ connection systems have been designed to eliminate the risk of under- or over-tightening with a patented torque limiting mechanism. This unique feature emits a haptic "click" feedback when it reaches the optimum torque, assuring a perfect installation every time. MarvelXACT™ incorporates advanced MarvelX™ Sealing Technology to deliver precise face sealing (sealing at the port bottom), which eliminates additional internal volume, and minimizes carryover risk, peak tailing, and peak broadening.

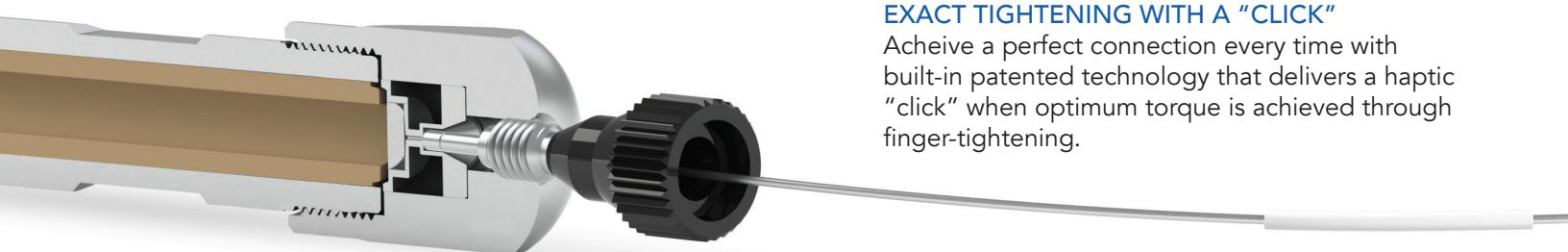
## MarvelXACT™ VS. CONVENTIONAL CONED FITTINGS



Conventional coned fittings require a ferrule in conjunction with a fitting for proper sealing. They depend on tools, to improve sealing performance, which significantly increases probability of extra internal volume and poor chromatography results. The mechanical tightening increases wear leading to higher replacement costs.



MarvelXACT™ fittings do not depend on ferrules. They seal with hand tightening at the bottom of the port, which significantly reduces required torque and enables many more connects and disconnects reducing wear and increasing product life. An enhanced proprietary tip design also ensures zero dead volume (ZDV) and better chromatography results.



### EXACT TIGHTENING WITH A "CLICK"

Achieve a perfect connection every time with built-in patented technology that delivers a haptic "click" when optimum torque is achieved through finger-tightening.

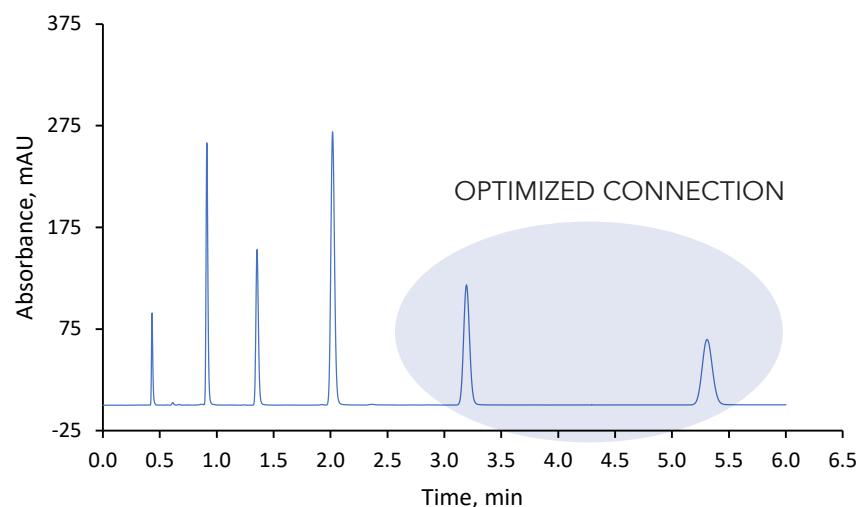
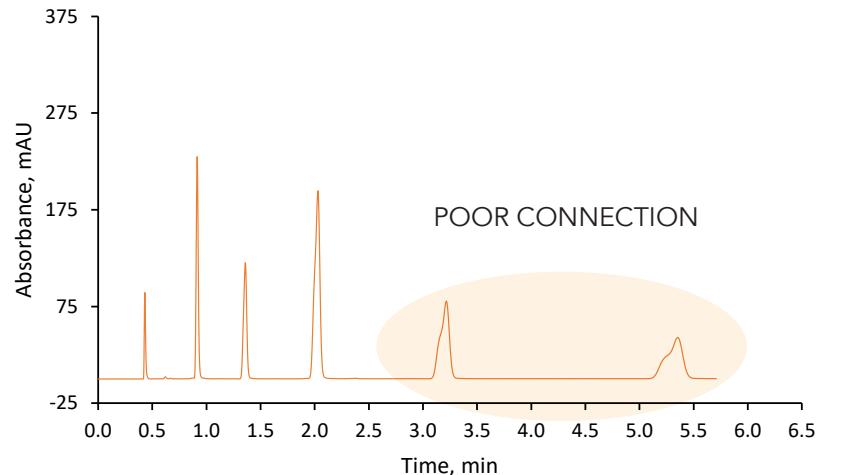


### FLEXIBLE TUBING

1/32" OD tubing prevents kinking and allows considerable flexibility to route throughout the instrument.

## CONNECTION CONSEQUENCES

When a poor connection is made to the injector, distorted peak shape and leaks may occur. In this example, the connecting tubing was not fully seated into the injector port which caused a slow leak and distorted peak shape, especially for the later eluting peaks.



## FINGER-TIGHT TO UHPLC

MarvelXACT™ is truly a finger-tight connection system that has a patented torque-limiting mechanism for exact tightening every time, and seals up to 19000 psi (~1310 barr) for routine use.

## ROBUST TIP

Enable robust structure, superior re-usability, and minimizes chances of tip damage from connecting and disconnecting.

## SMALL & ACCESSIBLE

Fittings are small enough to fit in tight spaces, yet allow for finger-tightening at UHPLC pressures.

