

# NEWS

Glass Expansion Newsletter | February 2018 | Issue 45

## Application Spotlight

# Helix CT™ ICP Spray Chamber with ConstantTorque Technology Provides Consistent Day-to-Day Analytical Performance

## Abstract

Glass Expansion revolutionized spray chamber design for the ICP-OES and ICP-MS analyst by introducing cyclonic spray chambers. Prior to the Glass Expansion Tracey™ cyclonic spray chamber, Scott-style spray chambers were the standard option provided with your ICP. The design of Glass Expansion's cyclonic spray chambers helps the ICP analyst achieve sensitivity gains, reduced washout times, and reduced matrix effects not possible with other designs.

This article will provide a summary of Glass Expansion's unique cyclonic spray chamber features and describe the advantages of the new Helix CT™ ICP spray chamber with ConstantTorque™ technology.

## Introduction

Traditionally, ICP-OES and ICP-MS sample introduction systems have relied on o-rings to form a gas-tight seal between the nebulizer and spray chamber. There are several drawbacks with an o-ring seal, such as:

- Potential for contamination due to dead volume around the o-ring seal
- Chemical resistivity of strong acids and organic solvents
- The o-rings are difficult to replace, often requiring tools
- Bonding to the nebulizer can result in breakage

The evolution of Glass Expansion cyclonic spray design, specifically the advantages of the Helix nebulizer-spray chamber interface were summarized in a 2014 article.<sup>1</sup> In addition to the Helix interface, the benefits of each Glass Expansion cyclonic spray chamber model are detailed<sup>1</sup> making it easy for the ICP analyst to select the optimum spray chamber to suit their application needs. Glass Expansion is now pleased to introduce the new Helix CT (ConstantTorque) spray chamber, which provides a constant, reproducible, inert, gas-tight seal between the nebulizer and spray chamber (Twister™ with Helix CT shown in Figure 1 on page 2).

## GE News

### New CEO of GE USA

Ryan Brennan has taken up the position of CEO at Glass Expansion USA office. He replaces Jerry Dulude who has retired.

### New Product Manager

Our customer support team has been strengthened by the appointment of Mr. Justin Masone to our USA office. Starting his career in an environmental testing facility and having worked as a Product Specialist for Shimadzu as well as a Technical Sales Representative for Anton Paar. Justin will enhance our ability to help ICP users to get the best possible analytical performance.



February 26 - March 1  
Orlando, FL

Orange County Convention Center

[pittcon.org](http://pittcon.org)

### PITTCON 2018

A wide selection of Glass Expansion products will be on display at Pittcon. Orlando, Florida USA, February 26 - March 1, 2018.

Glass Expansion specialists will be on hand to answer your questions and assist you to choose the optimum components for your ICP.

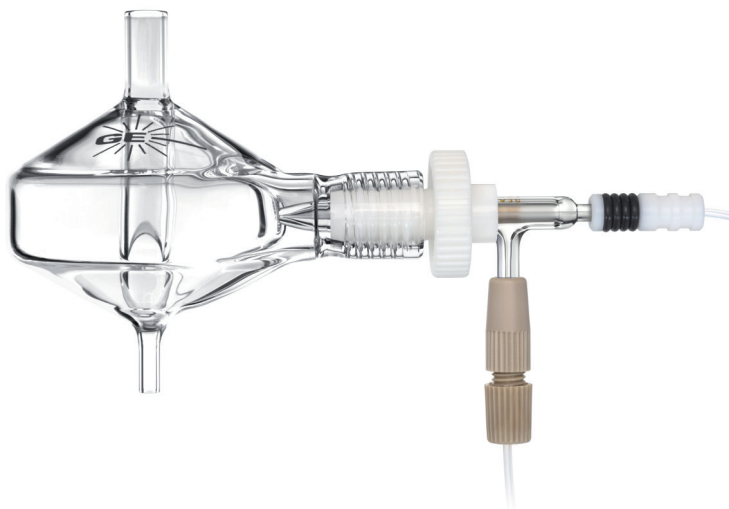
Please visit us at Booth 2555.

<https://pittcon.org/>

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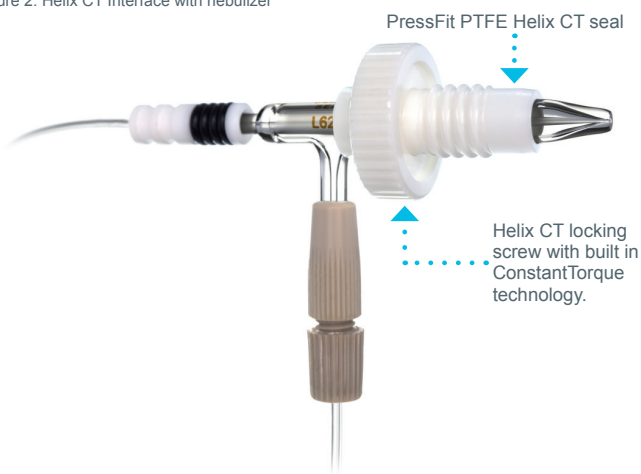
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Figure 1. Helix CT ICP spray chamber



The main feature of the Helix CT spray chamber is a new Helix CT locking screw with built-in torque control mechanism that allows for a consistent seal of the PTFE ferrule against the nebulizer – making it impossible to overtighten or undertighten while ensuring a gas-tight seal each and every time. A new PressFit PTFE ferrule provides a chemically inert seal around the nebulizer, which is immune to strong acids and organic solvents routinely used in ICP sample preparation (Figure 2). The new Helix CT spray chamber by Glass Expansion, therefore, eliminates all the drawbacks of the o-ring nebulizer seal, while improving user safety by preventing broken nebulizers.

Figure 2. Helix CT Interface with nebulizer



The new Helix CT nebulizer interface is also simple to use:

- Fully insert the nebulizer into the Helix CT interface, until the nebulizer side-arm comes into contact with the moulded-in positive stop.
- Hand-tighten the Helix CT locking screw until the ConstantTorque mechanism clicks, indicating a secure, gas-tight seal.

## Experimental

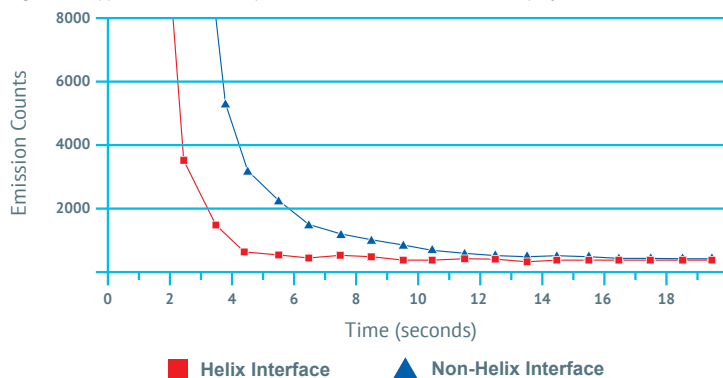
An Agilent® 5100 simultaneous dual view ICP-OES was used in combination with the SeaSpray Direct Connect (DC) nebulizer and Twister spray chamber with Helix CT to evaluate washout performance, in addition to highlighting the effects of nebulizer depth and torque applied to the nebulizer seal.

## Results

The Helix CT is the only nebulizer-spray chamber interface that significantly reduces the dead volume around the nebulizer. This unique design minimizes washout time with highly concentrated samples, reducing sample-to-sample carryover and improving sample throughput. Figure 3 compares the time required to washout a 10ppm Molybdenum standard with the Helix CT interface and a “Brand-X” spray chamber with an o-ring interface. The results show that with the Helix CT nebulizer interface a 10ppm standard can be washed out in as little as 4 seconds, whereas “Brand-X” takes 16 seconds. One can expect this time to significantly increase for more troublesome or “sticky” elements that are more prone to carryover issues.

Glass Expansion’s new Helix CT design maintains the positive stop of the original Helix to ensure that the nebulizer is inserted to the correct and optimum depth within the spray chamber so that both ion and atom lines give optimum sensitivities under a wide range of conditions.

Figure 3. 10 ppm Mo washout comparison between Helix and non-Helix spray chambers



The effect of a nebulizer depth relative to the aerosol impact zone inside a spray chamber was investigated by using radially measured background, atom and ion line intensities as well as the spectroscopically determined Mg ratios and Fe-excitation temperatures. The analytes studied were As (I), Cu (I), Cu (II), Mg (I), Mg (II), Mn (I), Mn (II), Se (I), Na (I) and K (I).

Figure 4 highlights the effect of nebulizer depth on Mn (I) and Mn (II) sensitivities as a function of nebulizer gas flow rate for two different height above the load coil (HALC) positions and two different nebulizer depths (3mm: closer to the aerosol impact zone and 9mm: away from the aerosol impact zone). For the atom line, the highest sensitivity difference is noted at the lowest nebulizer gas flow rate when the nebulizer is moved away from the aerosol impact zone relative to the closest position studied. For the ion line, increases in sensitivity difference at lower nebulizer gas flow rate changes to decreases at higher nebulizer gas flow rate when the nebulizer is moved away from the aerosol impact zone.

There is a crossover point clearly visible at 0mm HALC at approximately 0.7L/min nebulizer gas flow rate.

Figure 4. Mn (I) and Mn (II) sensitivities as a function of nebulizer gas flow rate for 2 different HALC positions, and 3 and 9mm nebulizer depths.

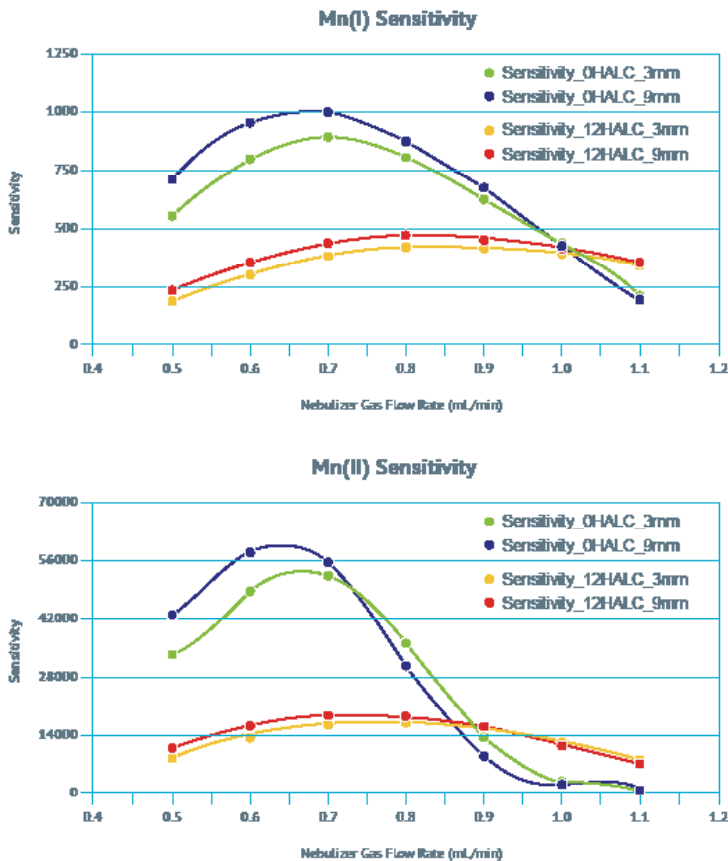


Figure 5. The Mg ratio and Fe-Excitation temperature as a function of nebulizer gas flow rate for 2 different HALC positions, and 3 and 9mm nebulizer depths.

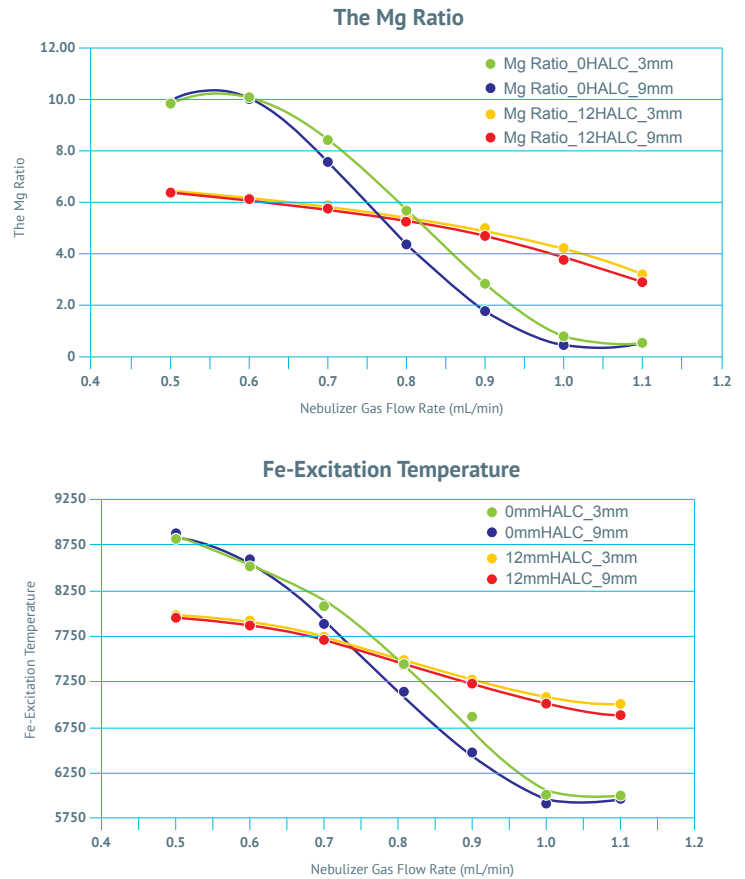


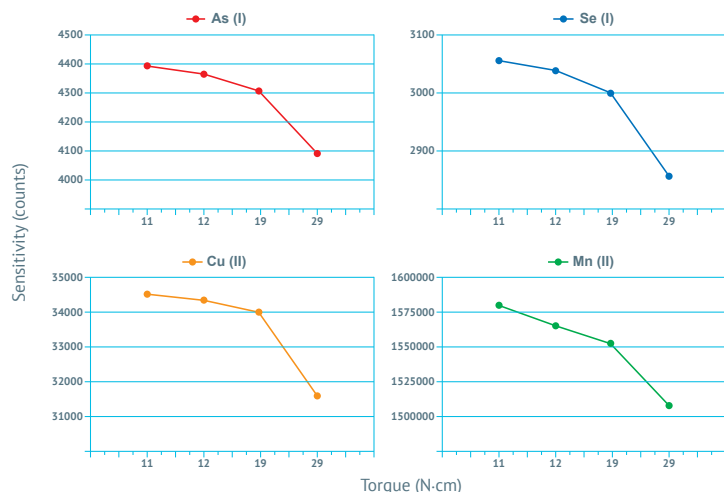
Figure 5 depicts the Mg ratio and Fe excitation temperature as a function of nebulizer gas flow rate. The results presented in Figure 5 indicate that both the Mg ratio and Fe excitation temperature show no significant difference at lower nebulizer gas flow rate whether a nebulizer is inserted closer or away from the aerosol impact zone inside the spray chamber. However, when the nebulizer gas flow rate is above about 0.7L/min and viewed closer to the load coil, the Mg ratio and Fe-Excitation temperature for the 9mm nebulizer depth are lower than that of the 3mm nebulizer depth. Therefore, the Mg ratio and Fe excitation temperature results indicate lower plasma temperatures when the nebulizer is moved away from the aerosol impact zone at higher nebulizer gas flow rates.

Therefore, the increase in sensitivity for both atom and ion lines can be attributed to the increase analyte loading to plasma when the nebulizer is inserted away from the aerosol impact zone and decrease sensitivity for ion lines can be attributed to the plasma cooling due to the increase nebulizer gas flow rates and water loading to plasma.

In order to address the above highlighted challenges, Glass Expansion's new Helix CT design maintains the correct and optimum nebulizer depth within the spray chamber so that both ion and atom lines give optimum sensitivities under wide range of experimental conditions.

In addition to nebulizer depth, the torque applied to the nebulizer seal is also critical. The data shown in Figure 6 (on page 4) highlights the effects of torque applied to the nebulizer seal versus the observed sensitivity. The applied torque was increased incrementally from 11 N·cm to 29 N·cm. As the torque applied to the glass nebulizer seal increases, the sensitivity decreased on average by 5%, with greatest difference being 8% (Cu (II)). The new Helix CT locking screw is set to the optimum torque and will seal the PressFit PTFE ferrule against the nebulizer to the same torque each day. This ensures the variation in intensity when performing routine nebulizer maintenance with a spray chamber using a Helix CT locking screw varies by only 0.5%.

Figure 6. Helix CT interface sensitivity vs. torque



## Conclusions

The results from our study show how dead volume around the nebulizer seal can affect washout efficiency, and ICP sensitivity is affected by both nebulizer depth within the spray chamber and the torque applied to the nebulizer seal. If consistent performance is crucial to your ICP laboratory, the new Helix CT spray chamber is your solution. The Helix CT spray chamber provides unparalleled, reproducible day-to-day ICP analytical performance.

Glass Expansion will now equip all of its glass, PFA, and PTFE spray chambers with the new Helix CT interface. However, if you already have a Helix spray chamber, you can easily upgrade to the Helix CT interface. The new Helix CT locking screw and PressFit PTFE ferrule are fully compatible with all Glass Expansion Helix style spray chambers. Achieving consistent day-to-day analytical performance in your ICP laboratory is just a click away with the new Helix CT cyclonic spray chamber, learn more at [www.geicp.com/HelixCT](http://www.geicp.com/HelixCT) and upgrade your ICP today.

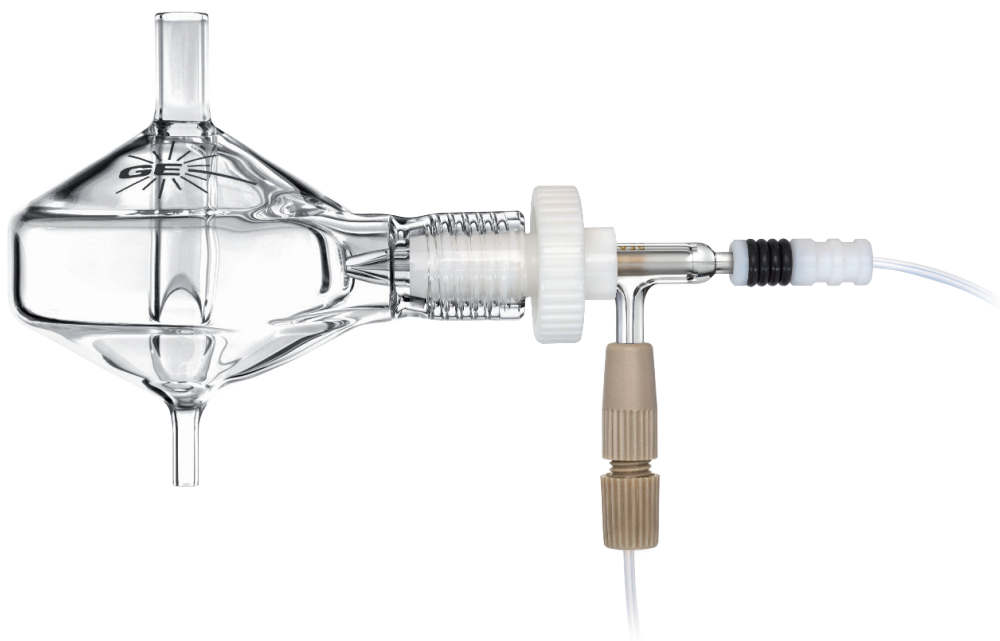
## References

1. Glass Expansion October 2014 Newsletter, "ICP Spray Chamber Update."

[http://www.geicp.com/site/GE\\_Newsletter/GE\\_Newsletter\\_October\\_2014/pubData/source/GE0283%20GE%20Newsletter%20October%202014.pdf](http://www.geicp.com/site/GE_Newsletter/GE_Newsletter_October_2014/pubData/source/GE0283%20GE%20Newsletter%20October%202014.pdf)

# NEW Helix CT ICP Spray Chamber

Consistent day-to-day analytical performance is just a click away with ConstantTorque technology.



A new Helix locking screw with CT technology allows for a consistent inert PTFE seal against the nebulizer - making it impossible to overtighten while ensuring a gas-tight seal each and every time. Torque control also improves user safety, preventing broken glassware.

A new PressFit Helix PTFE seal provides a chemically inert seal around the nebulizer. The PTFE ferrule is immune to strong acids and organic solvents routinely used in ICP sample preparation. It therefore eliminates all the drawbacks of the O-ring nebulizer seal, including broken nebulizers.

Compared to other types of nebulizer-spray chamber interfaces, the Helix CT is the only interface that significantly reduces dead volume around the nebulizer. This unique design minimizes washout time with highly concentrated samples, reduces sample to sample carry-over and improves sample throughput.

The new Helix CT interface still maintains the original positive stop to ensure that the nebulizer is inserted to the correct and optimum depth within the spray chamber. However, the torque applied to the nebulizer seal is also critical. Consistent nebulizer depth combined with ConstantTorque control provides the ICP analyst with unparalleled, reproducible day-to-day analytical performance.

## Helix CT Ordering Information

| Product                         | Product Number |
|---------------------------------|----------------|
| Helix CT Locking Screw and Seal | 70-803-1439    |
| Helix CT Seal (pack of 4)       | 70-803-1456    |

# Introducing PerkinElmer's® NEW Avio 500 ICP-OES

PerkinElmer's® [Avio 500 ICP-OES](#) is a truly simultaneous, dual view, and compact ICP-OES. It utilizes a vertical plasma and is engineered to handle even the most difficult, high-matrix samples without dilution, delivering productivity, performance, and faster return on investment.

- **Vertical Plasma Torch Design:** provides unrivaled matrix flexibility, minimizing sample preparation time – its design lets you quickly and easily make adjustments, even while the system is running.
- **Flat Plate™ Plasma Technology:** delivers a more robust, stable plasma with the lowest argon consumption of any ICP (50%+ less than other systems).
- **Dual View:** optimizes axial and radial plasma viewing to the extended linear dynamic range, measuring high and low concentrations in the same run, regardless of wavelength.
- **PlasmaShear™ System:** offers maintenance-free, argon-free interference removal, eliminating the need for high-extraction systems or cones, for fully automated interference removal.
- **Universal Data Acquisition:** enables simultaneous acquisition of all available wavelengths, with virtually no time or storage penalty.
- **Color PlasmaCam™:** for real-time viewing status evaluation of plasma, injector, and torch during analysis, simplifying method development and enabling remote diagnostic capabilities.
- **Syngistix™ Software:** provides an intuitive, left-to-right, icon-based design; built-in, preset methods for faster, easier operation, requiring minimal training; common software platform across AA, ICP, and ICP-MS.





# New ICP Expert software for ICP-OES from Agilent Technologies®

Update your ICP Expert software for 5100 and 5110 ICP-OES and enjoy the advanced automation features that will boost your productivity.

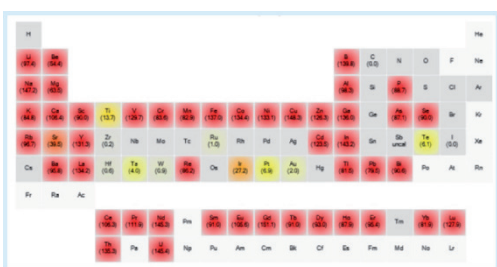
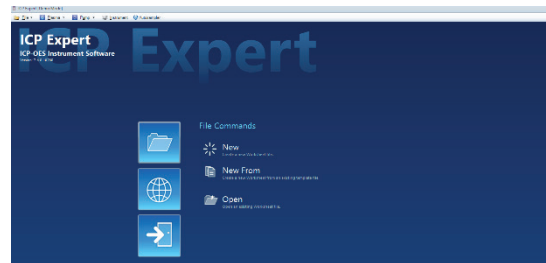
Version 7.4 of Agilent's® ICP Expert software offers a large range of new features including:

## Automated Instrument Performance Tests

Check your instrument is performing within specification using the automated test function

## Automate the tedious tasks in the lab

Support for autodilution is fully integrated into ICP Expert software. Perform multiple calibration points from single stock standard and perform overrange dilutions.



## Which elements are in your sample?

The intelliguant function enables rapid identification and an estimation of the concentration of over 70 elements in your sample. Use the heat map overlaid on the periodic table to quickly understand the relative concentrations.

## Slash rinse times to reduce your run time.

Intelligent rinse monitors the intensity of the nominated elements during the rinse period, automatically ending the rinse when these intensities reach a user specified threshold.

## Expanded QC + USP <232>/<233> and ICH Q3D compliance tools

Tests, methods and reports specifically for compliance to USP <232>/<233> and ICH Q3D are included.

Learn about the special promotion available to update your existing 5100 or 5110 software to the latest version. If you want more information, please visit us [here](#).