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TECHNICAL NOTE 71290

# Guidelines for method transfer and optimization—from earlier model Corona detectors to Corona Veo and Vanquish charged aerosol detectors


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## Summary

This technical note provides guidelines for method transfer and optimization of Thermo Scientific™ Corona™ Veo™ charged aerosol detectors and Thermo Scientific™ Vanquish™ charged aerosol detectors VH-D20-A and VF-D20-A.


## Initial settings

It is highly recommended that the respective default settings of Corona Veo and Vanquish charged aerosol detectors (CAD) are used as a starting point for all method development.

- Evap T = 35 °C
- Power Function Value = 1.0
- Filter Time Constant = 5.0 sec

*Note: When comparing chromatographic data between a Corona Veo or Vanquish CAD and an earlier model Corona detector, using the default conditions, it is fairly common to see a somewhat higher baseline level, noise and drift with Corona Veo and Vanquish detectors. This is typically due to a non-linear 'drop-off' in sensitivity of the earlier Corona models at the extreme low end of the dynamic range. This 'drop off' in sensitivity can mislead the user to think that the achievable lower limits of detection or quantitation with the Corona Veo or Vanquish detectors are poorer than that of earlier models. However, this is more likely due to the better sensitivity (relative absence of signal drop-off) of Corona Veo and Vanquish CAD to very low levels of non-volatile residue.*

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– It is important to check the limits of sensitivity by analyzing standards at levels approaching the noise or near the desired limits of detection and quantitation before choosing to adjust instrumental settings or method conditions

– Do not be misled by signal to noise ratios obtained solely from higher level standards since the detector response may be non-linear

## Selecting Evaporation Temperature (Evap T)

- Evap T is a variable available on Corona Veo and Vanquish detectors that can be adjusted to optimize performance for a given application

*Note: There is little to no relationship between the Nebulizer T setting on the Thermo Scientific™ Corona™ ultra RS™ detector and the Evap T setting on Corona Veo or Vanquish charged aerosol detectors.*

– The Nebulizer T setting on the earlier Corona ultra RS detector is provided mainly to prevent freezing due to rapid evaporative cooling that occurs with highly volatile eluents. However, the usefulness of Nebulizer T as a method control variable is very limited due to a very short residence time within the nebulizer.

- In general, use the lowest Evap T that provides acceptable limits of sensitivity
- As a starting point, we recommend the use of an Evap T of 35 °C
- Higher Evap T settings can be used when analytes of interest have low volatility, relative to the background. Since the volatility of background residue is typically unknown, experimentation is required for optimizing this parameter for a given method.
- With a Corona Veo RS or VH-D20-A detector, it is recommended to perform screening runs at a minimum of two Evap T settings, typically 35 and 40 °C, or additional tests in a maximum of 5 °C increments if needed
- Consider that higher Evap T settings may inadvertently reduce response for low analyte levels—even if considered as a non-volatile
- Remember to check limits of sensitivity by actual analysis of low level standards. Also, check analyte signal reproducibility at each Evap T setting.
- For detection of semivolatiles, lower Evap T settings may be used, however this may lead to higher background levels and noise

## Calibration and Power Function Value (PFV) settings

- Recommend using a PFV of 1.0 as a starting point or the same setting as used with an existing method on the Corona ultra RS detector
- Use the simplest curve fitting model that adequately describes the response-amount relationship over the required range of interest
- As with earlier Corona detector models, a linear fit can often be used over a small range, but response is inherently non-linear over a wide dynamic range
- For calibration when a linear fit is inadequate, consider using a:
  – Linear fit of log response vs log amount
  – Quadratic fit (second order polynomial)
- PFV settings other than the default of 1.0 can be used to extend the linear range of the detector output
  – PFV settings of greater than 1.0 are much more common than those less than 1.0
  – PFV settings of <1.0 may, in limited cases, help 'linearize' response for semivolatile analytes, albeit over a relatively narrow range
  – Avoid using too high a PFV as it could create or exaggerate a 'drop-off' in response near the lower limit of the dynamic range
- Always evaluate goodness of fit over the entire range with special consideration to the upper and lower limits
  – Consider that correlation coefficient (r) and coefficient of determination ($r^2$) are only aggregate measures of goodness of fit for least squares regression and may not adequately reflect goodness of fit near the sensitivity limits

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## Filter settings

- Corona Veo and Vanquish CAD filter settings are chosen based on a time constant
- The digital filtering algorithm used the with Corona Veo and Vanquish CAD is the same as earlier model Corona detectors
- The time constant in the Thermo Scientific™ Corona™ CAD detector (and Thermo Scientific™ Corona™ CAD Plus detector), however, is further modified by the slower electronic circuitry in these models. Table 1 provides a matrix to choose a Corona Veo filter setting that corresponds to a given setting used with an earlier model Corona detector.

**Table 1. Matrix for method transfer.**

| Corona CAD/CAD Plus | Corona ultra | Corona ultra RS | Rate for Corona CAD/CAD Plus/ ultra/ultra RS | Corona Veo | Vanquish CAD |
|---|---|---|---|---|---|
| n/a | none | 0 | 0.1 sec | 0.1 sec | 0.1 sec |
| n/a | Low | 1 | 0.2 sec | 0.2 sec | 0.2 sec |
| n/a | Medium | 2 | 0.4 sec | 0.5 sec | 0.5 sec |
| n/a | High | 3 | 1.0 sec | 1.0 sec | 1.0 sec |
| None | Corona (Default) | 4 (Default) | 3.6 sec | 2.0 sec | 2.0 sec |
| Low | n/a | 5 | 5.9 sec | 3.6 sec (Corona) | 3.6 sec (Corona) |
| Medium | n/a | 6 | 10.1 sec | 5.0 sec (Default) | 5.0 sec (Default) |
| High | n/a | 7 | 18.87 sec | 10.0 sec | 10.0 sec |

Find out more at **www.thermofisher.com/CAD**

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