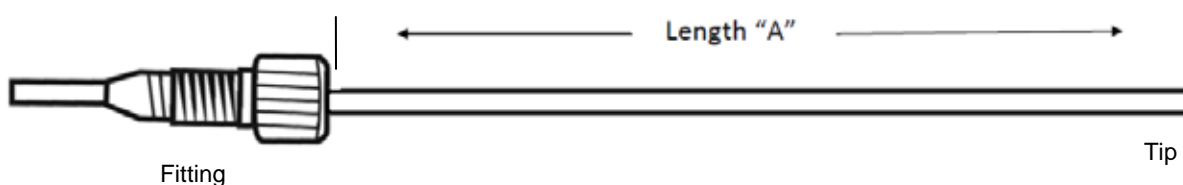


Guide to measuring a straight, custom-length Dry Powder Insufflator™ - Model DP-4



All Penn-Century aerosol drug delivery devices are available in custom lengths for intratracheal or other uses in larger species, in other locations of the body, or in *in-vitro*, *ex-vivo*, or other experimental laboratory set-ups. The delivery tube (Length A) may be straight, or have a bend.

For optimal intratracheal aerosol deposition in the lung and to avoid injury to the animal, the device must be measured correctly to assure that the portion inserted into the trachea is long enough to reach near to but not touching the carina (first bifurcation). In larger animals it may also be possible to insert the device in one lung, if desired. **It is the responsibility of the user to provide Penn-Century with the correct measurement for their particular use.**

Methods of measuring the delivery tube for *in vivo* intratracheal use

If the delivery tube of the custom Dry Powder Insufflator™ will be inserted in the trachea directly, or via an endotracheal tube or bronchoscope in a large animal, or used in a custom in-vitro lab set-up, it will require several steps to determine the correct length. Various methods have been used for determining the correct measurement for intratracheal use in larger animals, including:

- Dissecting an animal of similar size
- Using radio-opaque imaging agents to visualize the trachea
- In a primate, measuring the distance from the mouth to the teat (which is parallel to the carina) and adding an additional amount to assure sufficient length
- Ordering a Tubing Sample Kit from Penn-Century

Location of intratracheal portion is important to results

In prior published studies, optimal lung deposition from Penn-Century intratracheal aerosol devices was obtained when the device was positioned such that the very tip emerges from the end of the bronchoscope far enough to permit the aerosol to flow freely without impacting in the inside of the bronchoscope, and when the very tip is positioned near to, but not touching the carina. If the device is inserted only partially down the bronchoscope or only partially down the trachea, it is possible that the dry powder will impact on the walls of the bronchoscope or trachea and good distribution will not be achieved.

Measurement of a custom-length Dry Powder Insufflator™ – Model DP-4

The Dry Powder Insufflator™ is the only device made by Penn-Century that can be made with longer custom delivery tubes in either of two materials:

- rigid, stainless steel tubing or
- flexible plastic tubing

Please check and read the section that applies to you:

— The Dry Powder Insufflator™ will be inserted directly into the trachea:

- The user must pre-determine the correct length to assure that the portion inserted into the trachea reaches a point close to, but not touching the carina. The user may need to make this measurement by means of dissection or other means to establish the best length.

— The Dry Powder Insufflator™ will be inserted into the trachea via an endotracheal tube:

- The stainless steel delivery tube of the Dry Powder Insufflator™ is hollow and has a rounded tip. Outer diameter .050" (1.1 mm) except at rounded tip which is .058". Inner diameter: .038"
- The inner diameter of the endotracheal tube must be large enough for the stainless steel delivery tube of the Dry Powder Insufflator™ to pass through it easily.
- The user must pre-determine the correct length and placement of the endotracheal tube so that it reaches a point close to, but not touching the carina. The user may need to make this measurement by means of dissection or other means to establish the best length for the endotracheal tube.
- The delivery tube must be sufficiently long to pass through the endotracheal tube AND emerge very slightly from the far end of it – so that the dry powder is not trapped inside the ET tube and can flow freely into the lungs.
- The user can place some tape or a mark on the stainless steel delivery tube of the Model DP-4 to indicate how far they will need to insert it into the endotracheal tube, once the animal has been intubated, to assure that the tip is emerging from the end of the endotracheal tube.
- The stainless steel version of the Dry Powder Insufflator™ – Model DP-4 is not flexible and the user must be able to insert the device straight into the trachea of the anesthetized animal without needing to bend it.

— The Dry Powder Insufflator™ will be inserted into the trachea via a bronchoscope/endoscope:

1. A flexible, custom-extruded plastic delivery tube is available in any length for the Dry Powder Insufflator™ – Model DP-4 that is narrow enough to fit down the working channel of a bronchoscope and can be flexed as the bronchoscope is moved around in the animal's chest.
2. For purposes of measuring the device prior to order, please note that the process of positioning, flexing and manipulating the bronchoscope while in use may cause the flexible plastic delivery tube of the Dry Powder Insufflator™ to curve and retract inside the bronchoscope. It must be sufficiently long to emerge slightly beyond the end of the bronchoscope – even when manipulated.
3. Therefore, the user must compensate for this by measuring the distance from the top of the instrument port to the end of the bronchoscope using sample tubing that will mimic the chances in length that can occur when the device is in use. It is better to have a device that is somewhat too long than one that is somewhat too short.

4. When in use, the user can place a mark or some tape on the plastic delivery tube of the Dry Powder Insufflator™ or mark to indicate how far they will need to insert it into the bronchoscope, to assure that the tip is emerging slightly from the end of the bronchoscope.
5. Once the Dry Powder Insufflator™ is inserted into the bronchoscope and has been inserted into the trachea or lung of the animal

— **The Dry Powder Insufflator™ will be used in a custom, in-vitro lab set-up:**

1. Contact us with details on your requirements.

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