

APPENDIX A

MISCELLANEOUS SUPPORT DOCUMENTS

Quick Reference Guide to Flow Span

Definitions:

Maximum Potential Velocity (MPV) -- represents the maximum stack gas velocity for a given unit or stack. It can be determined either through velocity traverse testing or a formula calculation. It is expressed in units of standard feet per minute (sfpm), wet basis.

Maximum Potential Flow Rate (MPF) -- is the maximum stack gas flow rate in standard cubic feet per hour (scfh), wet basis. It is used for missing data purposes and to set the flow rate span value.

Calibration Units -- refers to the actual units of measure used in daily calibration error testing of a flow monitor (sfpm, ksfpm, scfm, kscfm, scfh, kscfh, acfm, kacfm, acfh, kacf, inH₂O, mmscfh, mmacf, afpm, kafpm).

Calibration MPF -- is the maximum potential flow rate expressed in calibration units. This value is not calculated for differential pressure (DP) type flow monitors.

Calibration Span Value -- is a calculated value which is used to determine the zero-level and high-level reference signal values for calibration error testing. It ensures that calibration tests are performed at levels that are representative of the actual values that the monitor is expected to be reading. It is expressed in calibration units

Flow Rate Span Value -- is a calculated value used to set the full-scale reporting range of a flow monitor, in scfh.

Full-Scale Range -- represents the largest value that a particular scale on the instrument is capable of measuring. It is a result of the design and construction (and subsequent modification) of the monitor itself. The full-scale range used for daily calibration error tests is expressed in calibration units. The full-scale range used for flow rate reporting is expressed in units of scfh, wet basis. The full-scale range must be greater than or equal to the corresponding span value.

Determination of Important Values:

- **MPV**

Test Results -- MPV may be determined based on velocity traverse testing. If this method is chosen, use the highest average velocity measured at or near the maximum unit operating load. (Part 75, Appendix A, Section 2.1.4.1)

Formula -- MPV may be determined using Equation A-3a or A-3b in Part 75, Appendix A, Section 2.1.4.1.

Historical Data -- MPV may be determined using historical data. If this method is used, the historical data must include operation at the maximum load level and the MPV must represent the highest observed flow rate. (Part 75, Appendix A, Section 2.1.4.3.)

- **MPF**

Multiply MPV (in sfpm, wet basis) by the inside cross sectional area (in square feet) of the flue at the flow monitor location. Then multiply this value by 60 to convert to scfh on a wet basis. That is:

$$\text{MPF}(\text{scfh}_{\text{wet}}) = \text{MPV}(\text{sfpm}_{\text{wet}}) \times A(\text{ft}^2) \times 60(\text{m/h})$$

Round the MPF upward to the next highest multiple of 1000 scfh.

- **Calibration MPF (Non-DP type monitors, only)**

Multiply MPF (in scfh, wet basis) by the appropriate conversion factors to convert to calibration units. That is:

$$\text{Calibration MPF (cal units)} = \text{MPF}(\text{scfh}_{\text{wet}}) \times [\text{Conversion to cal units}]$$

This value should not be calculated if a DP type flowmeter is used.

- **Calibration Span Value (Non-DP type monitors)**

Convert MPV into the units that will be used for the daily calibration test. Then multiply this value by a factor no less than 100 percent and no greater than 125 percent and round up the result to no less than two significant figures. In other words, the rounded result should have at least two significant figures and should follow engineering convention by not having more non-zero figures than the precision of the measured values used in the calculation. (Part 75, Appendix A, Section 2.1.4.2) That is:

$$\text{Calibration Span} = \text{MPV}(\text{sfpm}_{\text{wet}}) \times [\text{Conversion to cal units}] \times [\text{Multiplier 1.00 to 1.25}]$$
$$\text{Value (cal units)}$$

or

$$= \text{Calibration MPF (cal units)} \times [\text{Multiplier 1.00 to 1.25}]$$

- **Calibration Span Value (DP type monitors)**

For DP-type monitors, multiply the MPV (sfpm) by a factor no less than 1.00 and no greater than 1.25. Convert the result from sfpm to units of actual feet per second (afps). Then, use Equation 2-9 in Reference Method 2 (40 CFR 60 Appendix A) to convert the actual velocity to an equivalent delta P value in inches of water. Retain at least two decimal places in the resultant delta P, which is the calibration span value.

- **Flow Rate Span Value (All flow monitors)**

Calculate the flow rate span value as follows:

$$\frac{\text{Flow Rate}}{\text{Span Value (scfh}_{\text{wet}})}} = \text{MPF (scfh}_{\text{wet}}) \times [\text{Multiplier 1.00 to 1.25}]$$

Round the flow rate span value upward to the next highest multiple of 1000 scfh.

- **Full-Scale Range for Reporting**

Select the full-scale range for reporting hourly flow rates so that the majority of readings obtained during normal operation will be between 20 and 80 percent of full-scale (Part 75, Appendix A, Section 2.1). The full-scale range must be equal to or greater than the flow rate span value.