

REVISION HISTORY

Control Valve Sizing Worksheets

8/27/15: Revised the Liquid worksheet to correct an error in the formulas on Line 327 Columns T, U and V. With choked flow and valve size less than pipe size this error caused incorrect values to appear on Line 15, Columns E, F and G. The Gas and Steam worksheets are unchanged.

9/7/15: Replaced the download with Rev 1a. The only change is that the sheet protection password for the Liquid sheet was incorrect.

10/5/15: Replaced the download with Rev 1b of the zip file. The Gas and the Steam & Vapor sheets are replaced with Rev 1 of both files. This corrected an error in the calculation that confirms that the calculated Cv will give the flow that was input into the worksheet. (Line 16 on the Gas sheet and Line 17 of the Steam and Vapor sheet.) All other calculations on both sheets remain unchanged. There is no change to the liquid sheet.

11/13/15: Replaced the download with REV 2 of the zip file. Each of the worksheets now has a new tab "Full Open Flow". This is an optional calculation that allows the user to calculate the valve's fully open flow. See the "instructions" to learn how this works and why it is useful.

11/26/15: Replaced the download with REV 2a. This made a few minor revisions to the fully open flow calculations in the Liquid and gas files. There were no changes to the "Steam or Vapor" file.

12/22/15: Replaced the download with Rev 3. This is a major revision. The three valve sizing worksheets include optional new tabs, "**Installed Flow**" and "**Installed Gain.**" A new worksheet has been added that converts the 0 – 90 degree valve parameters of some manufacturers of rotary control valves to the 0 – 1.0 relative flow parameters required by the new tabs. The first tab "**Valve Sizing**" is exactly the same as it was in the previous revision.

1/24/16: Replaced the download Rev 3 with Rev 3.1. The sizing worksheets changed to Rev 3.1. The installed gain graphs are simplified to include the two vertical lines in data series instead as separated items. This is transparent to the user. Added error checking to the installed flow and installed gain graphs to suppress drawing of the graphs if data entered on the Valve Sizing tab is inconsistent with the requirements for the process pressure model to be valid.

Specifically, the system pressure model will not be valid, and the installed flow and installed gain graphs will not be drawn if the following requirements have not been met:

1. The maximum design flow is to be entered in Column G. Therefore the flow in

Column G must be greater than the flow entered in Column D. (The pressure model is also invalid if the maximum and minimum flows are equal.)

2. P1 must be constant or decreasing with increasing flow.
3. P2 must be constant or increasing with increasing flow.
4. Flow is fully turbulent. (This applies only to the Liquid worksheet, which is the only one that includes a non-turbulent calculation.)

Error messages indicating any of these reasons for the graphs not being drawn will appear on the Installed Flow tab to the right of the graph area.

1/24/16: Replaced the download Rev 3.1 with Rev 3.1a. Minor changes to the installed flow and installed gain graphs which should be transparent to the user.

2/2/16: Replaced the download Rev 3.1a with 3.1b. The sizing worksheets changed to Rev 3.1b. Added additional data points to the installed gain graphs. Depending on the data specific to a particular calculation this change can improve the resolution of an installed gain graph.

5/17/17: Replaced the download with Rev 3.1c which adds to the choice of Valve SPL codes (VSC), code 5 "Multi-Stage Globe." The noise calculation is for a representative multi-stage valve. Multi-stage valves vary widely in design and performance. This new calculation is intended to give the user a general idea of the sort of noise reduction that is possible with multi-stage globe valves, but does not represent any particular manufacturer's design or model.

The noise calculations in the worksheets have always been based on the methods presented in the Metso Automation *Flow Control Manual*, which is based mainly on VDMA 24422 (1979). For all of the valve style codes (VSC) except VSC 6 "Multi-Stage Globe", the method includes corrections that have been empirically determined by Metso.

9/6/17: Replaced the download with Rev. 3.2 of the Zip file and all three worksheets. All calculations remain unchanged, but an area has been placed above the user interface that makes it very easy for the user to configure the user interface for any of the sets of engineering units that are supported by the ISA and IEC standards. Simply by entering a single digit code, all the engineering unit headings in Column B and all the necessary "N" factors and "FLAGS" are automatically set for the desired set of engineering unit inputs. In addition, the GAS worksheet, which requires flow to be input in "Standard flow" units (such as scfh), allows the user to select the standard reference temperature that agrees with their "standard flow" data. (15C/60F or 0C/32F)

10/31/17: Replaced the download with Rev. 3.4 of the Zip file (There was no release of a Rev. 3.3.) Added tabs to calculate optional F_L and x_T values based on the calculated values of C_v . What was previously the "Control Valve Sizing – Steam or Vapor" has been renamed "Control Valve Sizing – Gas Mass Flow." The calculations have not changed. What was previously the "Control Valve Sizing – Gas" has been renamed "Control Valve Sizing – Gas Volumetric Flow." The calculations have not changed.

The Gas Volumetric Flow has a new tab “Mol Mass” that can calculate the molecular mass if it is not known. The Gas Mass Flow has a new tab, “Density” that can calculate gas density if it is not known.

11-2-17: Replaced the download with Rev 3.41 of the zip file. Fixed minor bug in the x_T calculation for parabolic plug globe valve.

1-23-18: Replaced the download with Rev 3.5 of the zip file. The formulas for F_L and x_T have been replaced with data from a newer source. Nothing else has changed.

4-25-18: The zip file Valve Sizing Worksheets Rev 3.5a.zip was placed on the web site and then withdrawn several hours later.

4-27-18: Replaced the download with Rev 3.5b of the zip file. The Liquid sizing sheet has been replaced with Rev. 3.5b. Some formulas in Columns S, T, U, and V have been replaced to make it easier for the interested user to compare these formulas with the ISA/IEC standards. The calculation results have not changed. There were no revisions to the other worksheets.