

Software support for AFV sizing: An intelligent sizing tool for the Axial Flow Valve



In order to get the most out of our Axial Flow Valve, it requires an intelligent sizing tool. Our highest priority is to equip our customers with the necessary expertise to be able to optimally use the AFV.

The current product based on this strategy is the sizing tool now available to the public. This tool can be operated intuitively and allows the user to fully configure an AFV installation.

Starting from the design prerequisites, such as gas type and gas temperature, maximum and minimum inlet and outlet pressures and maximum flow capacity, the tool guides the user through the AFV sizing process to complete configuration.

With the "Stage Type" selection, the system type is determined, i.e. whether the calculation should be based on a "Single Stage" pressure reduction or on an active/monitor configuration (when the "Monitor" option is selected). In order to set up an active/monitor configuration, it is most sensible to start by basically sizing a single stage configuration and then converting this into an active/monitor setup using the completely filled out spreadsheet. To illustrate this better, an icon for the selected configuration is displayed next to the selection field.

With the help of the sizing tool, all the relevant parameters can be calculated and configured:

- Calculating a single stage regulator
- Calculating an active/monitor configuration
- Inlet and outlet pipe flow velocity
- Sizing the AFV
- Determining the entire configuration including manifold (inspirator/restrictor) configuration and pilot configuration
- Sleeve selection
- Noise calculation
- Noise reduction with external silencer calculation

Station	Gas	Gas temperature	Stage Type	Scenario 1	Scenario 2
Sample Project	Natural Gas	15°C	Single Stage	P1: 30 bar	25 bar
System Boundaries				P2: 5.0 bar	7.5 bar
Pipes				Inlet pipe size: DN100	DN100
AFV				AFV ANSI: ANSI300	ANSI300
AFV size				DN60	DN60
Block				Inspirator	Inspirator
Sleeve				HE7	HE7
Flow				3003 Nm³/h	24873 Nm³/h
Max. cap. (fully open)				29223 Nm³/h	24 473 Nm³/h
Capacity (part. open)				51%	61%
AFV ANSI				ZSC-100 (3/32")	ZSC-100 (3/32")
AFV size				1.7-10bar	1.7-10bar
Block				Inspirator	Inspirator
Sleeve				HE7	HE7
Partially open				100%	100%
Noise AFV				97,1 dBA	97,1 dBA
Silencer				-15,9 dB	-15,9 dB
Noise with Silencer				81,2 dBA	81,2 dBA

The real sizing is an iteration, with which according to the design conditions the valve size of the AFV may be optimized manually, taking into account the partial open capacity. If boundaries are exceeded, the relevant values or selection fields are marked in red with attributed comments. An auxiliary field that can be freely positioned is superimposed on every selection field, which briefly and concisely provides important tips on the respective entry.

The manifold block to be used (either the inspirator or the restrictor) can be determined during configuration. The selection is included in the calculation and is taken into consideration when calculating the partial open capacity of the sleeve. The positive effects of this can be seen in particular for slight pressure differentials, for which use of the inspirator block is usually preferred. For pilot configuration, the relevant pilot combinations and the associated adjusting springs are suggested with

reference to the outlet pressure and the inlet pressure differential.

In addition to the sizing tool, the file includes an instruction manual, information on the control accuracy and selection support for the manifold block type and the general station setup.

The sizing tool is based on Microsoft Excel. Further processing of the sizing results is therefore very easy. At the simple click of a button ("Copy Data to Clipboard"), a sizing result can be completely copied to the clipboard, so that it may be pasted onto a separate sheet. Configuration variations can thus easily be placed next to one another, so that the optimum one may be found. Alternatively, a screenshot of the sizing sheet can be printed directly and used for documentation purposes.

In the end, the sizing sheet contains all the necessary configuration details and can

be used directly for sending us an enquiry. A further advantage of embedding the data in MS Excel is that formulae can also be used in the input cells to be able to convert units directly. Another possibility is linking several spreadsheets, in order to calculate multistage systems. One stage may thus be completely sized in one sheet, and the interstage pressure is linked to a second sheet as an inlet condition. By varying the interstage pressure, the optimum operating point can be found for the respective control stage. Even more possibilities are certainly conceivable!

In this way, we can provide our customers with an extremely flexible and versatile tool. We are pleased to be able to offer this new service. If you are interested, please contact Elster GmbH, Mainz-Kastel, or one of your local contacts.

Paul Ladage

paul.ladage@elster.com