



Virtual Engineer: Sporlan Division

Expansion Valves

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Expansion Valves

The expansion valve meters refrigerant flow through the evaporator by controlling superheat at its outlet. This sizing tool supports three types of expansion valves.

Thermostatic Expansion Valves

The thermostatic expansion valve (TEV) controls the flow of liquid refrigerant entering the direct expansion (DX) evaporator by maintaining a constant superheat of the refrigerant vapor at the outlet of the evaporator. The TEV controls the difference between the actual temperature and the saturation temperature of the refrigerant corresponding to the suction pressure at the sensing bulb location; this is superheat.

By controlling superheat, the TEV keeps most of the evaporator surface active, while preventing liquid refrigerant from returning to the compressor. The ability of the TEV to match refrigerant flow to the rate at which refrigerant can be vaporized in the evaporator makes the TEV the ideal expansion device for most air conditioning and refrigeration applications.

Refer to [Bulletin 10-10](#) for more information on Sporlan TEVs.

Electric Expansion Valves

Electronically operated step motor flow control valves, or Electric Expansion Valves (EEV) are intended for the precise control of liquid refrigerant flow. Synchronized signals to the motor provide discrete angular movement, which translate into precise linear positioning of the valve piston. Valve pistons and ports are uniquely characterized, providing extraordinary flow resolution and performance. EEVs are easily interfaced with microprocessor-based controllers, including Sporlan supplied controllers.

Refer to [Bulletin 100-20](#) for more information on Sporlan EEVs.

Pulse Width Modulation Valves

The Sporlan Pulse Width Modulation, or SPW valve line of electric expansion valves uses pulse width modulation (PWM) control to manage refrigerant flow in direct expansion CO₂, HFC, HCFC, and HFO (nonflammable and nontoxic) refrigeration systems. The valve's duty cycle is varied based on measured evaporator superheat. Typical controllers monitor superheat and vary the duty cycle across a six second period.

Refer to [Bulletin 30-30](#) for more information on Sporlan SPW valves.

Valve Sizing in Virtual Engineer

Inputting Sizing Information

Refrigerant is the type of refrigerant the system is operating with, by ASHRAE R-number designation.

Condensing Temperature is the saturated temperature at discharge or condensing pressure. It is checked against the Liquid Temperature. Virtual Engineer will not allow Condensing Temperature to be less than Liquid Temperature.

Liquid Temperature is the liquid refrigerant temperature at the inlet of the expansion valve.

Evaporator Temperature is the saturated temperature at evaporator or suction pressure. Virtual Engineer will allow Liquid Temperature to be less than the Evaporator Temperature.

Distributor Pressure Drop is the pressure drop across the distributor including the distributor tubes. **High Side Pressure Drop** includes pressure loss from line friction, vertical lift, and liquid line accessories such as a filter-drier or solenoid valve. If a value is not entered for either of these variables, Virtual Engineer defaults them to zero. Refrigerant in the liquid line is assumed to be vapor free.

Enter the required information into the left pane of the sizing tool. As information is entered, Virtual Engineer will filter products meeting that criteria in the right pane. When you have entered the

required information, valid products will be available to compare in the right pane, including Thermostatic, electric Stepper, and electric Pulse Width Modulation (PWM) valves. All valid products are included to compare by default. You may uncheck any product you don't wish to compare.

Getting Results and Comparing Choices

Click the "Compare" button at the top of the right pane to be taken to the Compare Table. The Compare Table will display the results of the selection, and the values input. The best selection within each compared product will be highlighted. The Compare Table will also show other selections within the compared products, based on the following % loading criteria:

- Balanced port Thermostatic Valves: 35% - 107%
- Non-balanced port Thermostatic Valves: 45% - 100%
- Electric Stepper and PWM Valves: 10% - 80%
- Pulse Width Modulation (Sporlan SPW Valves): 50% - 85%

Reserve capacity exists in Thermostatic valves. Reserve capacity is necessary in valve ratings to prevent undersizing on systems having higher than expected capacities, or systems that operate at lower than expected condenser pressure. Therefore, 100% (or slightly greater) loading is valid for Thermostatic valves.

No reserve capacity exists for Electric Stepper valves. At 100% loading, maximum flow at the given conditions has been achieved. The valve will not be able to supply any additional capacity.

Sporlan Pulse Width Modulation valves are rated at 100% duty cycle with no reserve capacity. The 50% - 85% recommendation allows additional capacity for pulldown at start-up and after defrost. Further consideration should be given to the liquid line size to avoid excessive liquid hammer. Liquid line velocity should not exceed 3 ft/second.


Note that certain refrigeration applications requiring fast pulldown may benefit from having the expansion valve oversized. For these applications, a selection with lower % loading than those highlighted may be a better choice. Best judgment should be used regarding how much valve oversizing the system will tolerate.

Virtual Engineer can also handle bleed ports for TEVs.

Click the "Select Columns" button at the upper left corner of the Compare Table to select what values you would like to appear in the Compare Table. Below is a quick explanation of the columns that can be selected for the Expansion Valve tool:

- **Valve Type:** The family that the valve belongs to
- **Nominal Capacity:** The rated capacity of the valve per ANSI/AHRI Standards
- **Percent of Rated Capacity:** How much of the valve's capacity is being used
- **Inlet Fitting Type:** The style of the inlet connection, ex. Outside Diameter Female (ODF), Flare (SAE), Flange

- **Outlet Fitting Type:** The style of the outlet connection, Outside Diameter Female (ODF), Flare (SAE), Flange
- **Equalizer Fitting Type:** The style of the equalizer connection if the valve is externally equalized, Outside Diameter Female (ODF), Flare (SAE)
- **Maximum Rated Pressure:** The maximum working pressure of the valve in ambient conditions
- **Construction:** The design of the port (TEVs only), ex. Balanced Port, Semi-Balanced, Conventional. Refer to [Bulletin 10-9](#) for more information on port construction.
- **Inlet Strainer:** If the valve has an inlet strainer, it will be listed here.
- **Adjustable Superheat:** Does the valve have a superheat adjustment feature?
- **OEM Product:** Is the valve only available to OEMs, or is it available through a Wholesaler?
- **Warnings:** Any warnings associated with the selection, such as a high or low loading condition, will display here.

After selecting columns, you can click and drag the column header to change the order of the columns. You can also click the  in the column headers to further narrow or sort your results.

Click the “Group by Series” button at the top of the Compare Table to group the results by the valve family they belong to. Click the button again to ungroup.

Click the “Close” button below the Compare Table or the X in the upper right corner of the screen to close the Compare Table and return to the input screen.

Configuring a Part and Saving Results

In the second column of the Compare Table, there are two buttons that can appear: “Configure” or “Select.”

Click the “Configure” button next to the desired series to be taken to its eConfigurator. The eConfigurator can be used to configure a part according to your unique system. The eConfigurator will give an item number that can be used to purchase your part. Click the “Save” button to save your configuration and return to Virtual Engineer’s dashboard. The configured part will appear in your system.

If a “Select” button appears next to the desired series, then there is no eConfigurator currently available for that product, and the series will be selected without any configuration.

Click the “Export” button at the upper right corner of the Compare Table to save your results as an Excel spreadsheet.

Click the blue page icon in the “RPT” column of the Compare Table to generate a summary report of your inputs and choices. If the part was configured using an eConfigurator, the item number will also appear in the summary report. This report can be downloaded as a PDF and printed as needed.