



Virtual Engineer: Sporlan Division

Discharge Bypass Valves

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Discharge Bypass Valves

Discharge Bypass Valves control system capacity with bypassed compressor discharge gas flow. On refrigeration systems, discharge bypass valves are used to prevent the suction pressure from going below the minimum value recommended by the compressor manufacturer. Sporlan Hot Gas Bypass valves provide a precise method of compressor capacity control in place of cylinder unloaders or the handling of unloading requirements below the last step of cylinder unloading. Both mechanical and electronically controlled valves are offered by Sporlan.

Mechanical Discharge Bypass Valve

There are two options for mechanical Discharge Bypass Valves, each providing unique benefits. Both types of mechanical valves open on a decrease in suction pressure. The DR (discharge regulator) series are direct acting valves and have an optional fully adjustable feature. The fully adjustable type utilizes a spring assembly which can be fixed at the desired pressure setting (opening pressure). When the evaporating pressure is above the valve setting, the valve remains closed. As the suction pressure drops below the valve setting, the valve responds and begins to open.

The HGB (hot gas bypass) series are pilot operated valves and have an optional solenoid stop feature. The solenoid in these valves is normally energized, which allows it to modulate in

response to changes in its outlet pressure or suction pressure. De-energizing the solenoid coil will cause the valve to close so that no discharge gas is bypassed. As the suction pressure falls below the pilot valve's setting, the pilot port modulates open. As the suction pressure rises above the pilot valve's setting, the pilot port modulates closed.

Refer to [Bulletin 90-40](#) for more information on Sporlan Mechanical Discharge Bypass Valves.

Electric Discharge Bypass Valve

Electronically controlled valves are generally used to directly control the temperature of the cooled medium with the use of temperature sensors and electronic controllers. They can be set to automatically maintain a desired minimum evaporating temperature regardless of the decrease in evaporator load. As a result, they are ideal for close tolerance temperature applications such as environmental chambers and process cooling.

The SDR series Electric Hot Gas Bypass valves modulate by the electronically controlled rotation of a step motor driving a gear train to position a pin or piston in a port. The SDR series valves all require electronic controllers to operate. The controller must be capable of sensing a pressure or temperature, calculating valve step position and, driving the step motor to properly achieve the desired valve position.

Refer to [Bulletin 100-60](#) for more information on Sporlan Electric Discharge Bypass 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.

Discharge Bypass Valve Setting is the minimum allowable saturated evaporator temperature at reduced load conditions. Virtual Engineer will not allow Discharge Bypass Valve Setting to be greater than Condensing Temperature.

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.

The **percentage load bypassed** is the percentage of the evaporator capacity that will be handled by the discharge bypass valve at minimum load conditions. For example, an evaporator

with a rating of 5 tons and operating at a minimum load of 2 tons will have a percentage load bypassed of 60% $[(5 - 3) * 100 / 5]$. The program will accept percentage value in the range of 5% to 100%. A percentage load bypassed of 100% is equivalent to a system operating at no load condition, i.e., the discharge bypass valve providing 100% of the load.

Evaporator capacity is the total cooling capacity of the evaporator. Virtual Engineer assumes one expansion valve per evaporator.

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 ADR, HGB, and SDR 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 a % loading criteria of 20%-100%. Virtual engineer assumes isentropic compression plus 50°F, with 25°F superheated vapor entering the compressor.

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 Discharge Bypass 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
- **Mechanical or Electric Valve:** Is the valve mechanically or electrically operated?
- **Internal Port Size:** The size of the valve's internal port
- **Adjustment Range (Mechanical Only):** The pressure adjustment range
- **Number of Steps (Electric Only):** Total number of steps at full stroke
- **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.