



## Virtual Engineer: Sporlan Division

### Head Pressure Control Valves

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#### Head Pressure Control Valves

Without good head pressure control during low ambient operation, a system can experience both running cycle and off-cycle problems. The typical method of maintaining normal head pressure in a refrigeration system during periods of low ambient temperature is to restrict liquid flow from the condenser to the receiver, and at the same time divert hot gas to the inlet of the receiver. Sporlan has adjustable and fixed setting direct acting head pressure control valves for systems from 1 to 35 tons, as well as electrically operated head pressure control valves.

#### Mechanical Head Pressure Control Valve

Sporlan offers three main types of mechanical head pressure control valves. The LAC-4 (**Low Ambient Control**) valve is a three way modulating valve that responds to discharge pressure. When the discharge pressure falls below the dome pressure, the valve modulates open to the discharge port which allows discharge gas to bypass the condenser. The LAC-5 and LAC-10 are also three way modulating valves, but they respond to receiver pressure. As the receiver pressure drops below the valve setting, the seat moves away from the discharge port allowing discharge gas to bypass the condenser.

The OROA is a nonadjustable head pressure control valve which performs the function of limiting the flow of liquid refrigerant from the condenser and at the same time regulates the flow of hot gas around the condenser to the receiver. The main orifice of the OROA valve is controlled by the valve diaphragm which causes the orifice to **Open on Rise of Outlet** pressure.

When the outdoor ambient temperature changes, the condensing pressure changes. This causes the receiver pressure to fluctuate accordingly. As the receiver pressure decreases, the OROA throttles the flow of liquid from the condenser. An ORD valve is an integral part of the OROA valve.

The ORI head pressure control valve is an inlet pressure regulating valve and responds to changes in condensing pressure only. The valve designation stands for **O**pens on **R**ise of **I**nlet pressure. When the outdoor ambient temperature changes, the ORI opens or closes in response to the change in condensing pressure.

The ORD valve is a pressure differential valve that responds to changes in the pressure difference across the valve. The valve designation stands for **O**pens on **R**ise of **D**ifferential pressure. Therefore, the ORD is dependent on some other control valve or action for its operation. And in this respect, it is used with the ORI or CDS valve for head pressure control.

Refer to [Bulletin 90-30](#) for more information on Sporlan Mechanical Evaporator Pressure Regulators.

## Electric Head Pressure Control Valve

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The Sporlan CDS family represents a line of electronically controlled step motor valves, designed to contribute minimal pressure drop to the system. By providing synchronized signals to the step motor, discrete angular movements are translated through a Digital Linear Actuator (DLA) into precise linear positioning of the valve piston. The balanced pistons and ports are uniquely characterized, providing superb flow resolution and performance across a range of applications and operating conditions.

Sporlan CDS valves are available in two styles—the CDS-2, CDS-4 and CDS-7 provide 2500 steps of resolution, while the larger CDS-9, CDS-16 and CDS-17 provide 6386 steps of resolution. Capable of tremendous versatility, CDS valves can be used to replace a variety of mechanical and solenoid valves throughout typical refrigeration and air conditioning systems, where low pressure drop and precise refrigerant flow control are desired. And because the valves are powered by an external controller, no pilot lines or high to low side bleeds are required.

Refer to [Bulletin 100-40](#) for more information on Sporlan CDS valves.

The SDR series 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. They can be used in conjunction with CDS valves in head pressure control applications.

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

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

**Head Pressure Setting** is the head pressure setpoint for the valve (saturated temperature at receiver outlet pressure).

**Minimum Ambient Temperature** is the minimum outdoor temperature at which the system operates.

**System Capacity** is the total cooling capacity of the system.

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 LAC, OROA, ORI, ORD, CDS, 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.

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 Head Pressure Control Valve tool:

- **Valve Type:** The family that the valve belongs to
- **Nominal Capacity:** The rated capacity of the valve per ANSI/AHRI Standards
- **Number of Receiver Pressuration Valves Required:** How many Receiver Pressuration Valves (ORD or SDR) are required

- **Design Ambient Temperature Pressure Drop:** Pressure drop across the condenser holdback valve in the summertime condition
- **Minimum Ambient Temperature Pressure Drop:** Pressure drop across the receiver pressurization valve in the wintertime condition
- **Port Size:** The size of the valve’s internal port
- **Adjustment Range:** The pressure adjustment range of the mechanical valve
- **Number of Steps:** Total number of steps at full stroke of the electric valve
- **Maximum Rated Pressure:** The maximum working pressure of the valve in ambient conditions

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

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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.