

# Wet DP Sensor Selection for Chiller Optimization

## FACTS

- The U.S. Small Business Administration notes that HVAC equipment accounts for 40% of energy usage in commercial buildings.
- Chillers use approximately 20% of the total electric power generated in North America, according to the US Department of Energy (DOE).
- High PSI range sensors do not provide the accuracy and repeatability required for optimizing a single chiller, let alone multiple chiller operation.

## CHILLER OPTIMIZATION

In order to improve chiller performance, plants will attempt to automate controls and actively compensate for both flow and differential pressure (DP) variations during loading, unloading and staging of chillers and pumps.

As the plant goes from one-chiller to multi-chiller operation, depending on which chillers and pumps are selected to operate, chilled water flow between the chillers can vary by 10% to as much as 45%. If a large enough flow imbalance exists, the chiller with the greater flow takes on more of the load as the other chiller lags in sharing the load. As loading and flow increases further, the chiller experiencing the greatest flow will exceed its maximum capacity first.

In many systems, a single DP pump control setpoint is used. However, there are significant benefits of determining which chiller is carrying more of the load, and adjusting the setpoint accordingly. By monitoring the DP accurately and coordinating the multi-chiller operation, the efficiency of the system can be improved as well as the life span of the chiller - resulting in both short term and long-term savings!

Accepting a lower accuracy on a single chiller system drastically reduces your ability to control. To a larger extent, when multiple chillers are being used in an attempt to “share the load” – consistent readings from chiller to chiller are critical to perform optimally.

## CHOOSING A DP SENSOR

The range and the accuracy of the chosen DP sensor can drastically impact the ability to optimize the chiller control. For example, consider a chiller designed to run at 40 PSI at full load. A chiller of this size may perform optimally in the 4-7 PSID range, across the evaporator. Using a 0-40 PSID and/or a lower accuracy sensor for a 4-7 PSID measurement means accepting a significantly lower accuracy at the lower range, as shown in Figure 1.

	Range (PSI)	Accuracy @ F.S. (%)	Accuracy @ F.S. (PSI)	Accuracy @ 4 PSI (%)
Higher Accuracy DP Sensor	0-10	± 0.25	± 0.025	± 0.6
	0-40	± 0.25	± 0.1	± 2.5
Lower Accuracy DP Sensor	0-10	± 1.00	± 0.1	± 2.5
	0-40	± 1.00	± 0.4	± 10

Figure 1: Comparison of different sensor accuracies and ranges at high and low measuring points.

Senva’s PW31 single diagram Pressure Transducers allows the user to more accurately ( $\pm 0.25\%$  F.S.) monitor the DP across the evaporator, water lines and various orifices in chillers. A single element is used to measure the differential, eliminating the line pressure effect as seen in remote sensor systems. This allows the PW31 to be sized according to the lower differential pressure range to achieve maximum accuracy.

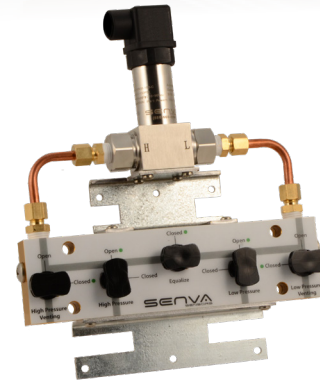
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With rugged 316 stainless steel construction and an IP65 rating, it can withstand even the harshest environment. It's also available with 3 or 5-Valve manifolds providing both the installer and end-user the ability to start-up and maintain the system from commission to maintenance.

In addition, the new optional display on the PW31 allows on-site trouble shooting and peace of mind that the intended DP is, in fact, present and accounted for in the system.

Again, where optimization of the chiller requires that you accurately measure the low-end performance across the evaporator – **higher ranged sensors will not have the sensitivity and repeatability on a single chiller, nevermind a multiple chiller operation.**

Senva can help provide the sensing technology to help both BAS integrators and Building Owners achieve their goals of improved building efficiency, lowering install and operating costs, and helping organizations deliver on Green Building initiatives. Sense the difference.



Add a 3 or 5-valve bypass manifold to meet any specification and streamline maintenance.



Order with an LED display (4-20mA models only) for faster commissioning and troubleshooting.



See Senva's Wet-Wet Products

Senva's PW31 stand-alone transducer achieves  $\pm 0.25\%$  accuracy at low DP ranges!



Account for efficiency improvements with an EMX power meter - ridiculously accurate metering.

**Warning:** Application notes contain installation ideas and tips. Although developed by engineers and installers, Senva disclaims any liability for injury or losses due to information provided. This information does not supersede codes and/or ordinances or regulatory standards. Application notes do not comprehensively cover safety procedures for working with live electrical equipment. Refer to installation instructions that accompany products and heed all safety instructions. Copyright © 2022 by Senva Inc. All rights reserved.