Honeywell
THE POWER OF CONNECTED

PX2 Series and PX3 Series Heavy Duty Pressure Transducers for Potential Use in Industrial Refrigeration

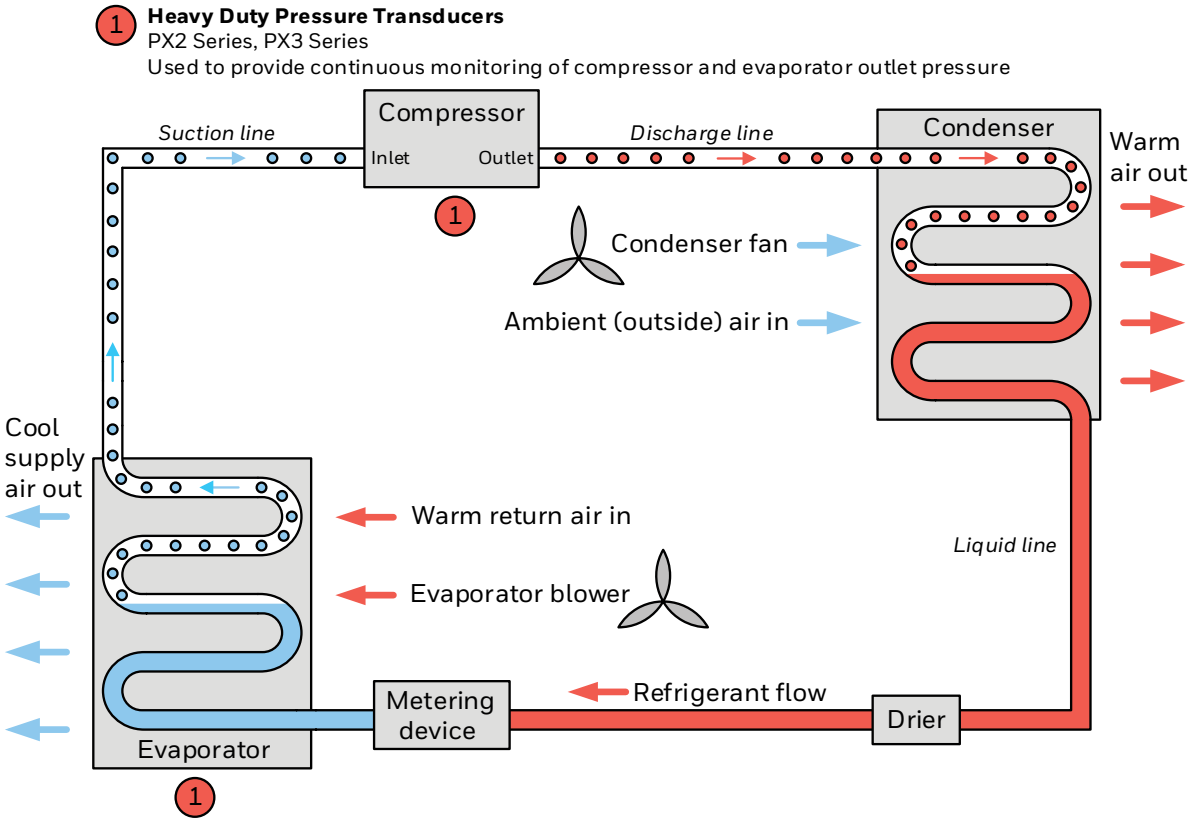
An Application Note

Background

There are four basic components in the HVAC/R cycle used by an industrial refrigeration unit (see Figure 1):

1. **Compressor:** Low pressure vapor full of latent heat from the evaporator is compressed and pumped to the condenser.
2. **Condenser:** Receives hot high pressure vapor from the compressor and releases its latent heat to the ambient air. Refrigerant condenses a hot liquid.
3. **Metering device:** Hot liquid from the condenser is forced through a flow restriction to reduce the pressure and change the hot liquid to a cold liquid.
4. **Evaporator:** Takes the cold liquid from the metering device and absorbs latent heat from the return air and changes to a cool gas.

Figure 1. Industrial Refrigeration Unit



The refrigeration cycle works because as the refrigerant changes from one state to another there is a large release or absorption of latent energy. By controlling the pressure of the refrigerant, the temperature of the phase change can be controlled. At low pressure, the refrigerant will change from a liquid to a gas and absorb latent heat energy at a lower temperature. At high pressure, the refrigerant gas can change from a gas to a liquid at higher temperatures, releasing latent energy.

Due to the high cost of energy, refrigeration systems need to be efficient. Controlling the high side and low side pressure to match refrigeration needs will increase system efficiency and help to reduce energy costs.

Solution

Honeywell's PX2 and PX3 Series are designed to provide continuous monitoring of compressor outlet pressure and evaporator outlet pressure to help control the flow of refrigerant (see Table 1).

The PX3 Series is designed to more effectively resist several cycles of freeze-thaw without frequent failure (see FIgures 1 and 2).

Figure 1. PX3 Series in Actual Industrial Refrigeration Application

Figure 2. PX3 Series Undergoing Freeze-Thaw Cycle Testing

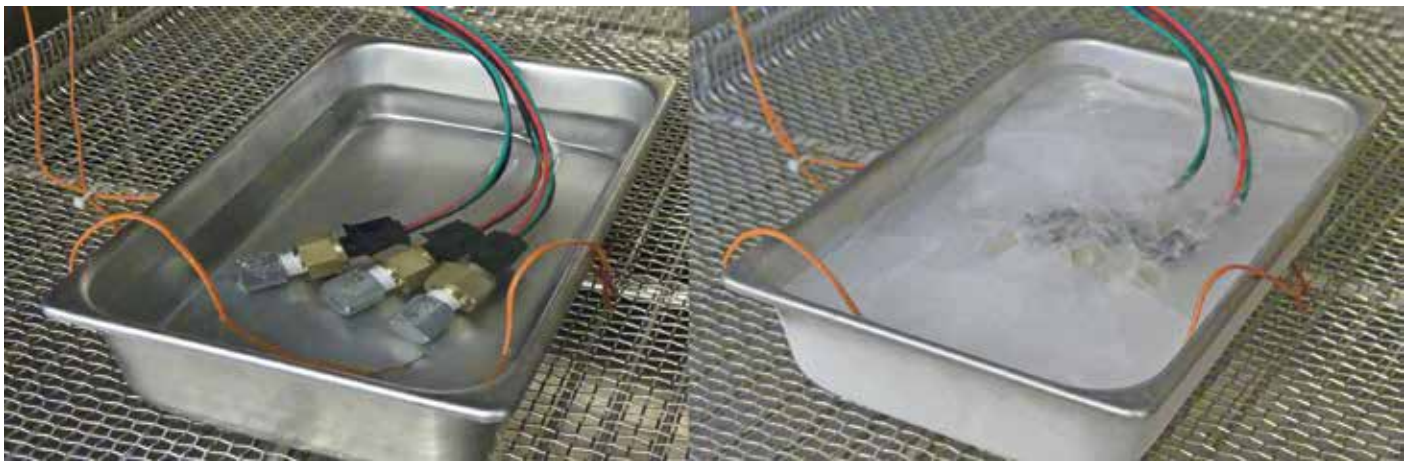


Table 1: PX2 Series and PX3 Series General Comparison

CHARACTERISTIC	PX2 SERIES	PX3 SERIES
		
OPERATING, COMPENSATED, AND STORAGE TEMPERATURE RANGE	-40°C to 125°C [-40°F to 257°F]	• Metri-Pack 150: -40°C to 125°C [-40°F to 257°F] • DIN male (EN 175301-803): -40°C to 125°C [-40 °F to 257°F] • Cable harness: - PVC: -40°C to 100°C [-40°F to 212°F] - XLPE: -40°C to 125°C [-40°F to 257°F]
TOTAL ERROR BAND	• ±2 %FSS: -40°C to 125°C [-40°F to 257°F]	• ±1 %FSS: -20°C to 85°C [-4°F to 185°F] (optimal) • ±2 %FSS: below -20°C [-4°F] and above 85°C [185°F]
PRESSURE RANGE	• 1 bar to 70 bar • 15 psi to 1000 psi • 100 kPa to 7 MPa	• 1 bar to 50 bar • 15 psi to 700 psi
PRESSURE REFERENCE	• Absolute • Sealed gage • Vented gage	• Absolute • Sealed gage
PRESSURE PORT MATERIAL	stainless steel 304	• Threaded ports: brass C36000 (lead (Pb) content: 3.7% max.) • Tube port: copper (per ASTM B 280, lead (Pb) free) and brazing alloy
OUTPUT TRANSFER FUNCTION	• Ratiometric: - 5.0 V: 10 %Vs to 90 %Vs - 5.0 V: 5 %Vs to 95 %Vs - 3.3 V: 10 %Vs to 90 %Vs - 3.3 V: 5 %Vs to 95 %Vs • Regulated: - 1 Vdc to 6 Vdc - Regulated: 0.25 Vdc to 10.25 Vdc - Regulated: 0.5 Vdc to 4.5 Vdc - Regulated: 1 Vdc to 5 Vdc • Current: 4 mA to 20 mA	• Ratiometric to 5 Vdc supply: 0.5 Vdc to 4.5 Vdc • Ratiometric to 3.3 Vdc supply: 0.33 Vdc to 2.97 Vdc • Current: 4 mA to 20 mA
EMC (RADIATED IMMUNITY) cable length = 1,5 m	100 V/m per ISO 11452-2	• Ratiometric: 200 V/m per ISO 11452-2 • Current: 140 V/m per ISO 11452-2
INGRESS PROTECTION	IP65, IP67, IP69K (depends on electrical connector type)	• Metri-Pack 150: IP67 • DIN male (EN 175301-803C): IP65 • Cable harness: IP65, IP67, IP69K
EXTERNAL FREEZE/ THAW RESISTANCE	not specified	>6 cycles from -30°C to 50°C [-22°F to 122°F]
MEDIA COMPATIBILITY	• Common HFC refrigerants (e.g. R410A) • Low GWP refrigerants (e.g. R32, R1234ZE) • Engine oil, brake fluid, hydraulic fluid	• Common HFC (hydrofluorocarbon) refrigerants (R410A and R134A) • Low global warming potential (GWP) refrigerants (R448A/Solstice® N40, R32 and R1234ZE) • Engine oil • Petroleum-based hydraulic fluids (Mobil DTE 25) • Brake fluids (DOT3) • Dry air

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