

P100 Series Encapsulated Pressure Controls

The P100 Series Encapsulated Pressure Controls are compact, economical, direct-mount, snap-action, On/Off pressure controls, available in a wide variety of factory-calibrated, non-adjustable pressure setpoints.

The P100 controls are designed primarily for direct or pilot duty control of motors and other refrigeration or air conditioning application loads requiring precise, repeatable pressure control over a wide range of ambient conditions.

The P100 controls are available with a variety of pressure connection styles, electrical ratings, and switch actions. A high-pressure manual reset lockout is available on some models.



Figure 1: Examples of Standard P100 Encapsulated Pressure Controls

Features and Benefits	
<input type="checkbox"/> Compact Size and Lightweight Construction	Allows for mounting control directly to refrigeration piping or pressure tap points, and reduces space needed for controls
<input type="checkbox"/> Tamper-proof, Factory-Calibrated Pressure Setpoints	Provides accurate, repeatable pressure control at pressures ranging from vacuum to 750 psig
<input type="checkbox"/> Optional Trip-Free Manual Reset	Provides a manual-reset lockout function for unmonitored equipment that cannot be overridden or reset until system pressure returns to a specified level
<input type="checkbox"/> Optional Heavy Duty Electrical Contacts	Provides direct inline control of most single phase fractional horsepower motors

Overview and Application

The P100 Series Encapsulated Pressure Controls are designed for economical, compact, direct-mount, On/Off pressure control in refrigeration and air conditioning applications, and are compatible with all common non-corrosive refrigerants. P100 controls may also be used for other non-corrosive fluid applications.

IMPORTANT:	Except for those models listed as <i>Refrigeration Pressure Limiting Controls</i> , the P100 series pressure controls are intended to control equipment under normal operating conditions. Where failure or malfunction of a P100 pressure control could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory systems) intended to warn of or protect against failure or malfunction of the P100 pressure control must be incorporated into and maintained as part of the control system.
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Standard P100 controls are available in a variety of factory set, non-adjustable pressure setpoints. (See Table 1.) Non-standard models with customer specified setpoints are available in quantity orders only. (See *Ordering Information*.)

Some P100 control models are available with environmentally sealed electrical contacts, suitable for use in a wide range of ambient conditions.

Standard P100 controls feature Single-Pole, Single-Throw (SPST) electrical switches.

- **P100A** type controls feature SPST open-low switch action and automatic reset, and are typically used for low-pressure cut-out and condenser fan cycling applications.
- **P100C** type controls feature SPST open-high switch action and automatic reset and are typically used for high-pressure cut-out applications.
- **P100D** type controls feature SPST open-high switch action and a manual-reset lockout mechanism for high-pressure lockout applications.

- **P100E** type controls are non-standard models that feature a Single-Pole, Double-Throw (SPDT) switch.

Standard P100 control models are supplied with 48 in. wire leads. Some standard models have a conduit clamp for 3/8 in. flexible metal conduit or conduit box with an opening for a 1/2 in. conduit connector. (See Figure 1 and Table 1.)

Standard P100 controls are available with standard electrical duty ratings. P100 controls with heavy duty electrical ratings are available in quantity orders. (See *Electrical Ratings* and *Ordering Information*.)

Standard P100 controls have a 1/4 in. SAE brass female flare fitting with an internal Schrader Valve depressor. A variety of other pressure connection styles are available on non-standard models, in quantity orders, including 2 in. long, 1/4 in. diameter, copper-clad steel Thermal Isolation Fittings (TIFs). (See Figure 5, *Dimensions*, and *Ordering Information*.)

Non-standard models are also available with 1/4 in. male quick-connect spade terminals, wire leads of various lengths, and wire leads with 1/4 in. male or female quick-connect terminals. (See Figures 2 and 5, *Dimensions*, and *Ordering Information*.)

Operation

The P100 controls are snap-acting diaphragm pressure controls that respond to system pressure changes at specified non-adjustable, factory-calibrated setpoints.

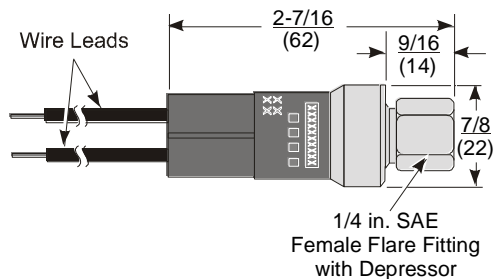
A bowed, stainless steel, snap-acting disc reverses its curvature when pressurized to the specified actuation setpoint. When the disc snaps, it drives a set of electrical contacts open or closed, depending on the controls switch action.

When the applied pressure returns to the specified deactuation setpoint on **automatic reset controls**, the snap-acting disc and electrical contacts reset to their original position.

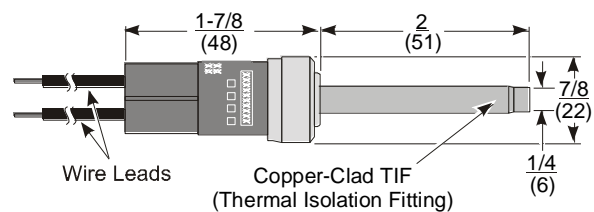
On high-pressure **manual reset controls** the disc remains in the reversed curvature position until the deactuation pressure is reached, **and** the manual reset button is pushed; returning the disc to its original position and closing the electrical contacts.

A “trip free” internal latching mechanism on manual reset controls does not allow the control to be reset until the system pressure reaches the specified deactuation setpoint, even if the reset button is held fully depressed.

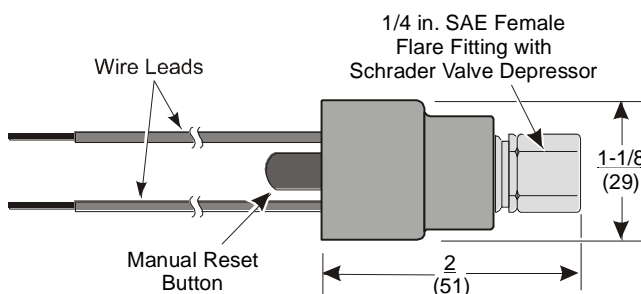
Dimensions



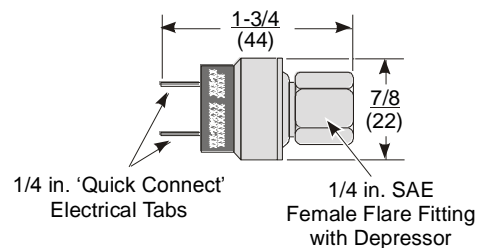
Standard P100AP, CP Type Pressure Controls



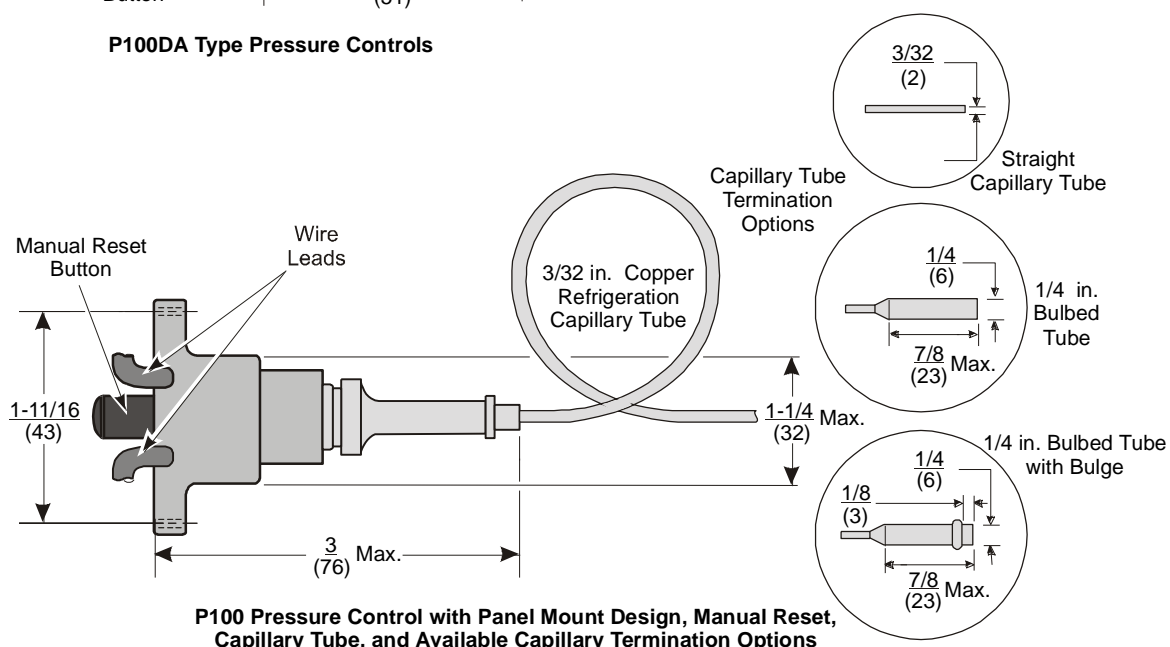
P100 Pressure Control with TIF Pressure Connection



P100DA Type Pressure Controls



P100 Pressure Control with 'Quick Connect' Electrical Connections and Schrader Fitting with Valve Depressor



P100 Pressure Control with Panel Mount Design, Manual Reset, Capillary Tube, and Available Capillary Termination Options

Figure 2: Typical P100 Pressure Control Dimensions, in. (mm)

Note: These dimensions are nominal and subject to accepted manufacturing tolerances and application variables.

Mounting

The compact size and lightweight construction of the P100 series controls allows mounting the control directly to the refrigeration piping or almost any other convenient pressure tap point on the system. Observe the following guidelines when installing the P100 controls.

IMPORTANT: If these controls are installed on equipment containing hazardous or regulated materials, such as refrigerants or lubricants, the installer and user should observe all regulations governing the handling and containment of those materials.

IMPORTANT: Pressure tap points should be located on the top side of the refrigerant lines. This reduces the possibility of sediment accumulating in the control.

Do Not Over Tighten Flare Nuts on Pressure Connection Fittings. Over tightening flare connections may damage the threads on the flare nuts or flare connectors, and result in refrigerant leaks. Do not exceed 9 lb-ft [12 N·m] of torque when tightening brass flare connections.

Avoid Severe Pressure Pulsation on High-Side Pressure Connections. Install P100 controls on pressure tap points away from the compressor discharge, to minimize the affects of pressure pulsation from reciprocating compressors.

Note: Refer to *Brazing a P100 with a Thermal Isolation Fitting Application Note (LIT-125512)* for guidelines on mounting controls with TIF pressure connections.

Wiring

P100 Encapsulated Pressure Controls are available with several switch options and electrical ratings. Check the label on the control body for model number. Refer to the following guidelines and diagrams when wiring the P100 controls.



WARNING: Risk of Electrical Shock. Disconnect power supply before making electrical connections to avoid possible electrical shock or equipment damage.

IMPORTANT: Make all wiring connections in accordance with the National Electrical Code and all local regulations. Use copper conductors only. Do not exceed the control's electrical rating.

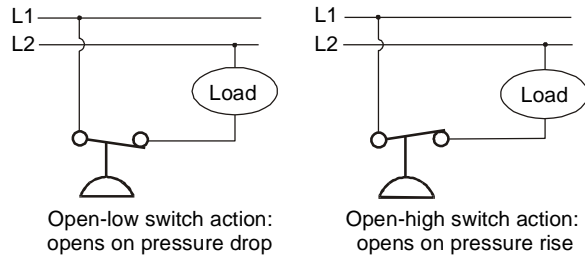


Figure 3: Wiring Diagrams for P100 Control Models with an SPST Switch

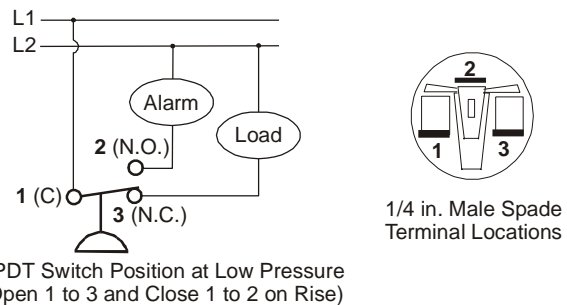


Figure 4: Wiring Diagram and Terminal Locations for P100E Control Models with an SPDT Switch

IMPORTANT: After mounting and wiring control, attach a reliable set of gauges to the controlled equipment and operate the equipment (at least) three cycles at the pressures necessary to verify control setpoints and proper operation.

Do not exceed manufacturers' recommended pressure ratings for the controlled equipment or any of its components when operating the controlled equipment.

Repairs and Replacement

Field repairs to the P100 pressure controls must not be made. For a replacement control, contact an authorized Johnson Controls Sales Representative or Distributor, or Refrigeration Application Engineering at 414-524-5535.

Ordering Information

Standard P100 Control Models

Standard model P100 encapsulated pressure controls are available in single and quantity orders through Johnson Controls authorized distributors. Standard P100 control model features are listed in Table 1. Also, see Figure 1 for examples of standard models.

Non-Standard P100 Control Models

Non-standard P100 controls, built to customer specifications, are also available. **Most non-standard models require a minimum order of at least 100 controls. Some models require a 250 piece minimum.**

Refer to Table 2, Figure 5, and the following list for available P100 control options. Contact Refrigeration Application Engineering at (414) 524-5535 to place quantity orders for non-standard P100 control models.

Control Options for Quantity Orders

Pressure Setpoints

Setpoints between 10 in. Hg and 750 psig, and differentials up to 200 psi are available. Determine the required high setpoint for manual reset controls, and the high and low setpoints for automatic reset controls.

Thermal Isolation Fitting (TIF) Options

- 2 in. straight, 1/4 in. diameter TIF
- 2 in. nibbed, 1/4 in. diameter TIF
- 2 in. straight, 1/4 in. diameter TIF with bulge stop

Threaded Brass Female Fitting Options

- 1/4 in. SAE brass female flare fitting with internal Schrader valve depressor
- 1-1/2 in. straight 1/4 in. diameter copper tube with 1/4 in. SAE female flare nut
- 1/8 in. -27 NPT

Threaded Brass Male Fitting Options

- 1/4 in. -18 NPT
- 1/8 in. -27 NPT
- 1/4 in. SAE flare

Copper Capillary Tube Options

(Available in 12, 24, and 36 in.)

- Copper capillary tube (.093 in. outside diameter)
- Copper capillary tube (.093 in. outside diameter) with 1/4 in. bulbed termination
- Copper capillary tube (.093 in. outside diameter) with 1/4 in. bulbed termination with bulge stop

Control Switch Action Options

- Open-high, automatic reset
- Open-low, automatic reset
- Open-high, manual reset

Electrical Contact Options

(See *Electrical Ratings*.)

- SPST Standard duty
- SPST Heavy duty
- SPDT Heavy duty

Electrical Termination Options

- Wire leads with 1/2 in. stripped ends
- Wire leads with 1/4 in. male or female quick-connect terminals
- 1/4 in. male quick-connect spade terminals on control body (automatic reset models only)

Wire leads are available in various lengths.

Control Enclosure Options

- Open (no enclosure or conduit clamp)
- Conduit clamp for 3/8 in. flexible metal conduit
- Conduit box with hole for 1/2 in. conduit connector



Figure 5: Examples of Non-Standard P100 Pressure Control

Table 1: Standard P100 Control Models

Product Code Number	Switch Action	Setpoints - psig (kPa)		Replaces:								
		Opens	Closes	Ranco®	Robertshaw®	Saginomiya	Danfoss®	Klixon®	Supco	Wilspec	International Refrigeration Products	Gemline
P100AC-1C ²	Open on Pressure Drop	5 (34)	20 (138)	MPL-7001	-	ACB-2UA318W	-	PS80-K2-F0305-020-005	SLP0520	HR201A020005D	SLP0520	-
P100AP-355C		5 (34)	30 (207)	-	3100-002	-	-	-	SLP0530	-	-	-
P100AP-15C		10 (69)	25 (172)	HR00011A1R702	3100-050	ACB-2UA97W	061F7523	PS80-K2-F0307-025-005	SLP1025	HR201A025010D	SLP1025	-
P100AP-201C		10 (69)	32 (221)	MPL-7011	3100-050	ACB-2UA101	-	-	SLP1032	-	SLP1032	-
P100AC-2C ²		15 (103)	30 (207)	MPL-7002	-	-	-	-	-	-	-	-
P100AP-356C		20 (138)	45 (310)	-	3100-003	ACB-2UA40W	-	-	SLP2045	-	-	-
P100AP-12C		25 (172)	50 (345)	-	-	ACB-2UA143	-	PS80-K2-F0316-050-005	SLP2550	HR201A050025D	SLP2550	-
P100AP-9C		25 (172)	80 (551)	MPL-7003	3101-003	-	-	PS80-K2-F0325-080-005	SLP2580	HR201A080025D	SLP2580	-
P100AP-105C		30 (207)	60 (413)	-	3100-004	ACB-2UA94	-	-	-	-	SLP3560	-
P100AP-2C		35 (241)	60 (414)	MPL-7004	3100-004	-	-	-	SLP3560	-	SLP3560	-
P100AP-10C		40 (276)	60 (413)	HR00011A1R704	-	-	-	-	-	-	-	-
P100AP-357C		40 (276)	80 (551)	-	3100-052	ACB-2UA354W	-	PS80-K2-F0326-080-005	SLP4080	HR201A080040D	SLP4080	-
P100AP-361C		50 (345)	90 (620)	-	-	-	-	PS80-KS-F0328-090-005	SLP5090	HR201A090050D	SLP5090	-
P100AP-358C		75 (517)	100 (689)	-	-	ACB-2UA441W	-	-	-	-	SLP75100	-
P100AP-351C ¹		75 (517)	120 (827)	-	-	-	-	-	SFC75120	-	-	-
P100AP-352C ¹		110 (758)	170 (1,171)	-	-	-	-	-	SFC110170	-	-	-
P100AP-353C ¹		126 (868)	264 (1,819)	-	-	-	-	-	SFC125265	-	-	-
P100AP-3C ¹		150 (1,034)	225 (1,551)	MPF-7008	-	ACB-2UA685W	-	-	SFC150225	-	-	-
P100AP-359C ¹		165 (1,137)	215 (1,481)	-	3100-215	ACB-2UA48W	-	-	-	-	-	-
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Product Code Number (Cont.)	Switch Action	Setpoints - psig (kPa)		Replaces:								
		Opens	Closes	Ranco®	Robert- shaw®	Saginomiya	Danfoss®	Klixon®	Supco	Wilspec	International Refrigeration Products	Gemline
P100AP-4C ¹	Open on Pressure Drop	170 (1,172)	250 (1,724)	-	-	ACB-2UA631W	-	-	SFC170250	-	-	-
P100AP-362C ¹		195 (1,344)	240 (1,654)	-	3100-080	-	-	-	-	-	-	-
P100AP-200C ¹		195 (1,344)	275 (1,895)	-	-	-	-	-	-	-	-	-
P100AP-354C ¹		210 (1,447)	275 (1,895)	-	-	ACB-2UA319W	-	-	SFC210275	-	SFC210275	-
P100EE-79C		300 (2,068)	370 (2,551)	-	-	-	-	-	-	-	-	-
P100AP-332C ¹		300 (2,068)	400 (2,758)	MPF7010	-	ACB-2UA627W	061F7514	-	SFC300400	-	-	-
P100CP-157C	Open on Pressure Rise	225 (1,550)	150 (1,034)	-	-	-	-	-	-	-	-	-
P100CP-158C		250 (1,723)	150 (1,034)	-	-	-	-	PS80-K1-0336- 250-150	SHP250150	HR202A250150D	SHP250150	-
P100CP-159C		270 (1,860)	200 (1,378)	-	-	-	-	-	-	-	-	-
P100CC-9C ²		275 (1,896)	175 (1,207)	-	3100-112	ACB-2UB724W	-	-	-	-	-	-
P100CP-91C		300 (2,067)	200 (1,378)	-	-	ACB-2UB723W	-	PS80-K1-0341- 300-200	-	HR202A300200D	SHP300200	-
P100CP-166C		325 (2,239)	225 (1,550)	-	-	-	061F6080	PS80-K1-0346- 320-230	SHP325225	HR202A325230D	-	-
P100CP-140C		350 (2,412)	245 (1,688)	-	3100-150	ACB-2UB273W	061F3212	PS80-K1-0348- 350-245	-	HR202A350245D	SHP350250	-
P100CP-160C		375 (2,584)	275 (1,895)	-	-	ACB-2UB191	061F7509	-	-	-	SHP375265	-
P100CP-161C		400 (2,756)	200 (1,378)	-	3100-152	-	-	PS80-K1-0357- 400-200	SHP400200	HR202A400200D	SHP400200	-
P100CP-162C		400 (2,756)	280 (1,929)	-	-	-	-	PS80-K1-0358- 400-280	SHP400280	HR202A400280D	SHP400280	-
P100EE-78C		400 (2,756)	300 (2,068)	-	-	-	-	-	-	-	-	-
P100CP-1C		400 (2,758)	300 (2,068)	MPH-7107	3100-151	ACB-2UB35	061FS14	PS80-K1-0359- 400-300	SHP400300	HR202A400300D	SHP400300	PC 151
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Product Code Number (Cont.)	Switch Action	Setpoints - psig (kPa)		Replaces:								
		Opens	Closes	Ranco®	Robert-shaw®	Saginomiya	Danfoss®	Klixon®	Supco	Wilspec	International Refrigeration Products	Gemline
P100CP-156C	Open on Pressure Rise	410 (2,825)	290 (1,998)	-	-	-	-	-	-	-	-	-
P100CP-163C		425 (2,928)	300 (2,067)	-	-	-	-	PS80-K1-0360-425-300	SHP425300	HR202A425300D	SHP425300	-
P100CP-2C		425 (2,930)	325 (2,241)	MPH-7108	3100-100	ACB-2UB282W	-	-	SHP425325	-	-	PC 100
P100CP-164C		450 (3,101)	250 (1,723)	-	-	-	-	PS80-K1-0363-450-250	SHP450250	HR202A450250D	SHP450250	-
P100CP-38C		500 (3,447)	325 (2,241)	-	-	-	-	-	-	-	-	-
P100CP-165C		600 (4,134)	475 (3,273)	HR00011B1R704	-	-	061F7517	-	SHP600475	-	-	-
P100CP-85C		665 (4,585)	565 (3,895)	-	-	-	-	-	SHP665565	-	-	-
P100DA-35C		350 (2,413)	Lockout Manual Reset	-	-	ACBPC45M	-	-	-	-	-	-
P100DC-3C ³		375 (2,586)	Lockout Manual Reset	-	-	-	-	-	-	-	SMR375	-
P100DA-1C		410 (2,827)	Lockout Manual Reset	-	3100-103	ACBPB115M	-	29PSL012-24	SMR410	HM202A410000D	SMR410	PC 103
P100DA-100C		415 (2,859)	Lockout Manual Reset	-	3100-103	-	-	29PSL004-1	-	HM202A415000D	SMR410	-
P100DA-101C		440 (3,032)	Lockout Manual Reset	-	-	-	-	-	SMR440	-	SMR440	-
P100DA-2C		475 (3,275)	Lockout Manual Reset	-	3100-106	-	-	-	-	HM202A475000D	-	-
P100DA-86C		575 (3,964)	Lockout Manual Reset	-	-	-	-	-	SMR575	-	-	-
P100DA-81C		630 (4,343)	Lockout Manual Reset	-	-	-	-	-	SMR630	-	-	-

1 Models are designed for condenser fan cycling.

2 Includes conduit clamp for 3/8 in. flexible metal conduit.

3 Includes conduit box with opening for 1/2 in. conduit connector.

Table 2: P100 Pressure Control Model Selection Matrix

P100	Direct mount, encapsulated pressure switch	
A	SPST Open-low switch action, automatic reset	
C	SPST Open-high switch action, automatic reset	
D	SPST Open-high switch action, manual reset lockout	
E	SPDT, automatic reset	
A	Open construction (no conduit clamp or conduit box)	
C	Conduit clamp or conduit box	
E	Heavy duty electrical contacts (high current capacity) models	
G	High cycle life (250,000 cycles) models, open construction (no conduit clamp or conduit box)	
J	High cycle life (250,000 cycles) models, with conduit clamp or conduit box	
P	Open construction (no conduit clamp or conduit box), upgraded style	

Note: Not all matrix combinations are available. To verify product availability and for quantity orders of non-standard items, contact Johnson Controls/PENN Refrigeration Application Engineering at (414) 524-5535.

Electrical Ratings

Table 3: Standard Duty Electrical Contact Ratings

Switch Action—Model Numbers	SPST—P100AA, AC, AG, AJ, CA, CC, CG, CJ, DA, and DC		SPST—P100AP, CP	
Motor Ratings	120V	240V	120V	240V
AC Full Load Ampere	5.8	2.9	6.0	6.0
AC Locked Rotor Ampere	34.8	15.0	36.0	36.0
Non-Inductive Ampere	-	-	-	-
Inductive Ampere	-	-	-	-
Pilot Duty	375 VA		375 VA	

Table 4: Heavy Duty Electrical Contact Ratings

Switch Action—Model Numbers	SPST—P100AE and CE				SPDT—P100EE			
Motor Ratings	120V		240V		120V		240V	
Contact Type	N.O.	N.C.	N.O.	N.C.	N.O.	N.C.	N.O.	N.C.
AC Full Load Ampere	13.0	13.0	10.0	10.0	5.8	13.0	2.9	10.0
AC Locked Rotor Ampere	65.0	60.0	45.0	45.0	34.8	60.0	17.4	45.0
Non-Inductive Ampere	13.0	25.0	10.0	25.0	10.0	25.0	5.0	25.0
Inductive Ampere	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Pilot Duty	278 VA	125 VA	278 VA	125 VA	278 VA	125 VA	278 VA	125 VA

Specifications

Product	P100 Encapsulated Pressure Controls
Electrical Ratings	120 and 240 VAC at 50/60 Hz (See Tables 3 and 4 for ampere ratings.)
Burst Pressure	3,500 psi (24,132 kPa)
Maximum Overpressure	250 psi (1,724 kPa) overpressure rating for P100 controls with 20 to 100 psi (138 to 690 kPa) working pressure 600 psi (4,137 kPa) overpressure rating for P100 controls with 100 to 500 psi (690 to 3,448 kPa) working pressure 800 psi (5,516 kPa) overpressure rating for P100 controls with 500 to 700 psi (3,447 to 4,826 kPa) working pressure
Refrigerant Temperature	-65 to 275°F (-54 to 135°C)
Ambient Temperature	Operating: -20° to 150°F (-29° to 66°C) Shipping: -40° to 185°F (-40° to 85°C)
Dielectric Strength	750 Vrms Across Open Contacts 1,550 Vrms (minimum) Terminals to Fitting
Ambient Humidity	0 to 95% RH non-condensing; Maximum Dew Point: 85°F (29°C)
Agency Listings	UL Recognition (US): File SA516, CCN SDFY2 UL Recognition (Canada): File SA516, CCN SDFY8

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, contact Johnson Controls/PENN Refrigeration Application Engineering at (414) 524-5535. Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.



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