P78 Series Controls for Dual Pressure and Hazardous Location Applications

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Installation Guide

P78XLCW

Applications

P78 Series Controls for Dual Pressure and Hazardous Location Applications provide combined high and low pressure control using a low energy signal from inside an explosive zone on commercial refrigeration and air-conditioning applications. The controls have special **dry circuit** switches with gold-plated contacts for improved contact characteristics that are required in circuits with low voltage and low current.

IMPORTANT: Use this P78 Series Control only as an operating control. Where failure or malfunction of the control could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the control.

IMPORTANT : Utiliser ce P78 Series Control uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du contrôle risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du contrôle.

These controls are available in several pressure ranges and are compatible with propane refrigerants. They are designed to operate in

- Group II, Zone 2 environments, as defined in the ATEX Directive and UKEx regulations.
- Class I, Division 2, Group D environments, as defined in NFPA 70 and CSA C22.2.

They are equipped with fail-safe double bellows on the high side, and two 6 mm outer diameter copper tubes for connecting to the refrigerant lines. Two adjustment lock plates are included with these models.

IP54 (Type 1 NEMA) enclosures are standard on these models.

P78 control models allow users to install alarm devices or other control circuits (see Figure 4).

Table 1 lists the standard models and features of P78 controls for dual pressure and hazardous location applications. These standard models are available through most authorized Johnson Controls®/Penn distributors.

Table 1: Standard P78 Dual Pressure Controls for non-corrosive refrigerants

Model number	Pack type	Low pressure side		High pressure side		Maximum bellows pressure, barg (psig)
		Range, barg (psig)	Differential, bar (psi)	Range, barg (psig)	Differential, bar (psi)	
P78XLCW-18000C	Individual pack	-0.5 to 7 (-7.25 to 102)	0.6 to 3 (9 to 44)	3 to 30 (44 to 435)	3 fixed (44)	LP: 22 (319) HP: 33 (479)

Repair information

If the P78 Series Pressure Control fails to operate within its specifications, replace the unit. For a replacement P78 control, contact the nearest Johnson Controls/Penn distributor or representative.

Installation

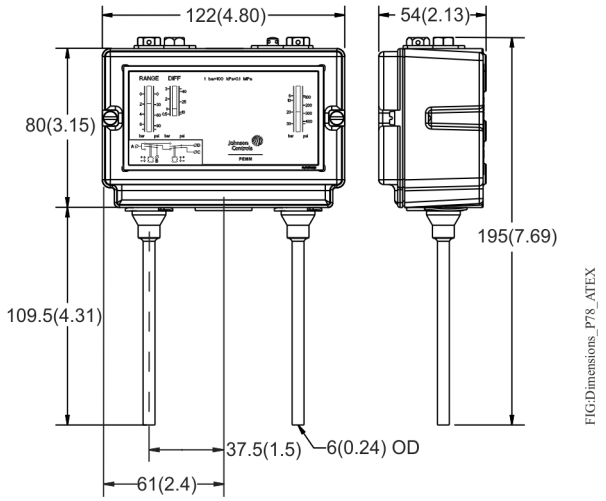
IMPORTANT: Components within the P78 control can exceed the enclosure temperature by 1°C (2.1°F). For standard applications, limit the maximum media temperature on the control to 80°C (176°F). When the media temperature exceeds 80°C (176°F), you must ensure that the media temperature does not cause a thermal ignition risk on parts between the media and the enclosure.

Always install P78 controls in refrigeration systems that comply with European Ex installation standard, EN 60079-11, any local directive and legislation, and any other regulation applicable.

Dimensions

See Figure 1 for control dimensions. These dimensions are nominal and subject to accepted manufacturing tolerances and application variables.

Figure 1: P78 Dual Pressure Control with IP54 (Type 1 NEMA) enclosure dimensions, mm (in.)



Mounting

NOTICE

Risk of Property Damage.
Mount the P78 Dual Pressure Control according to the instructions and guidelines included with the control. These instructions and guidelines are intended to reduce the risk of malfunction of the control and resulting property damage. Failure to follow these instructions and guidelines could cause the control to malfunction, resulting in property damage.

NOTICE

Risque de dégâts matériels.
Montez le contrôle P78 selon les instructions et directives fournies avec le contrôle. Ces instructions et directives sont destinées à réduire les risques de mauvais fonctionnement du contrôle et de dégâts matériels. Le non-respect de ces instructions et directives pourrait provoquer un dysfonctionnement du contrôle et causer des dégâts matériels.

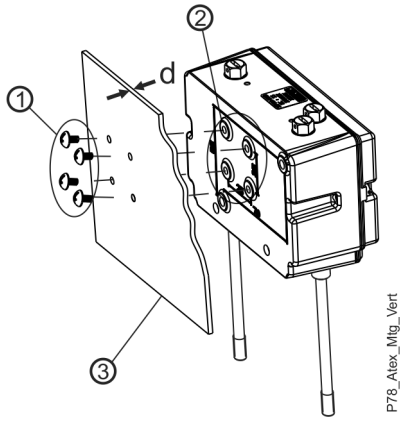
IMPORTANT: When you mount the control to a flat horizontal surface, use the screws provided and a universal mounting bracket (sold separately) to avoid damaging internal components. Be careful not to distort or bend the control case when mounting the control to an uneven surface. Using other screws or bending the control case voids the warranty.

Guidelines: Observe the following guidelines to mount the P78 dual pressure control:

- Mount the control in an accessible position, where the control and pressure-connection lines are not subject to damage.
- Mount the pressure control upright and level.
- Position the pressure-connection lines to allow drainage away from the control bellows.
- Locate pressure-tap points on the topside of the refrigerant lines to reduce the possibility of oil, liquids, or sediment accumulating in the bellows, which could cause control malfunction.
- Mount controls with IP54 (Type 1 NEMA) enclosures on horizontal or vertical flat surfaces.

Vertical Surface: Use four M4 x 6 mm + d screws (Callout 1) through the inner M4 holes (Callout 2) on the back of the control case when mounting directly to a flat vertical surface (Callout 3). Do not use screws longer than 6 mm + d, where **d** refers to thickness of mounting surface. See Figure 2.

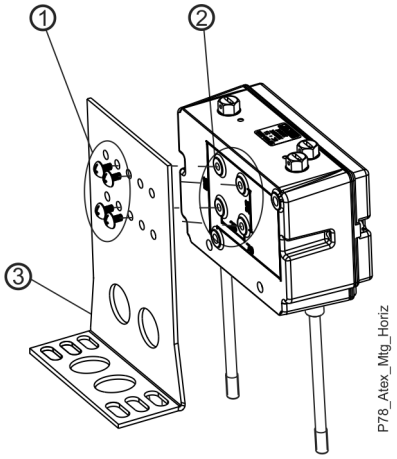
Figure 2: Mounting the P78 Dual Pressure Control on a vertical surface



Callout	Description
1	Four field supplied mounting screws for vertical surface, M4 x 4 mm + d. Do not use screws longer than 6 mm + d.
2	Four inner mounting M4 holes
3	Flat vertical mounting surface

Horizontal Surface: Use four M4 x 6 mm screws provided (Callout 1) and a universal mounting bracket (Callout 3) which is sold separately when you mount to a flat horizontal surface. See Figure 3.

Figure 3: Mounting the P78 Dual Pressure Control on a horizontal surface



Callout	Description
1	Four mounting screws for horizontal surface, M4 x 6 mm (Provided)
2	Four inner mounting M4 holes
3	Universal mounting bracket, Part Number 271-51 (1 pcs., NA only), 271-51L (50 pcs., EU only), Sold separately

Wiring

⚠ WARNING

Risk of Explosion or Fire.
Do not disconnect the P78 Pressure Control while its circuit is energized, unless the area is known to be nonhazardous. Disconnecting the P78 Pressure Control in a hazardous area while its electrical circuit is energized may result in an explosion or fire, and may cause serious injury or death.

⚠ AVERTISSEMENT

Risque de explosion ou incendie.
Ne pas déconnecter le contrôle de pression P78 lorsque son circuit est sous tension, sauf s'il est avéré que la zone est non dangereuse. La déconnexion du contrôle de pression P78 dans une zone dangereuse alors que son circuit électrique est sous tension risque d'entraîner une explosion ou un incendie et de provoquer des blessures graves, voire mortelles.

IMPORTANT: Use copper conductors only. Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the control's electrical ratings.

IMPORTANT: Use terminal screws furnished in the switch block. Using other terminal screws will void the warranty and may damage the switch.

IMPORTANT: The P78 control must be wired through a reliable means of limiting the voltage and current, placed outside the hazardous zone, to ensure insufficient energy supply to cause ignition of the surrounding atmosphere by an electrical spark or the heating of electrical components.

Check the label inside the control cover for the model number, switch action, and electrical rating. Check the wiring terminal designations on the control faceplate, and see the following wiring diagram when you wire the control. See Figure 4 and Table 2. Also see *Technical specifications*.

Figure 4: P78 Switch wiring

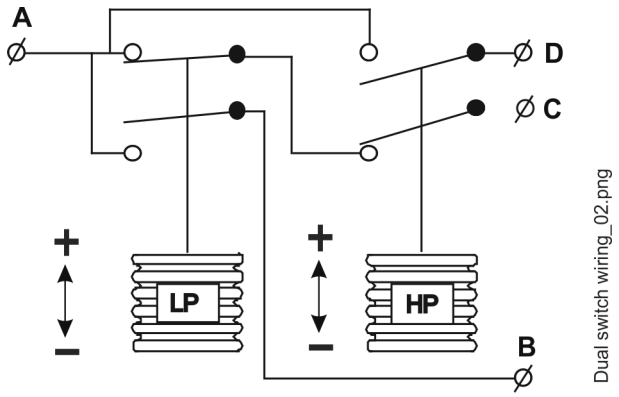


Table 2: P78 Switch wiring

LP/HP	Description
LP	A-C opens on pressure decrease.
	A-B closes simultaneously.
HP	A-C opens on pressure increase.
	A-D closes simultaneously.

Use only cables and cable entries that are approved for R290 (propane) applications. Do not allow cables to come into contact with sharp edges. Install cables with adequate stress relief to avoid pulling at the terminal.

Figure 5: Intrinsic safety protection method

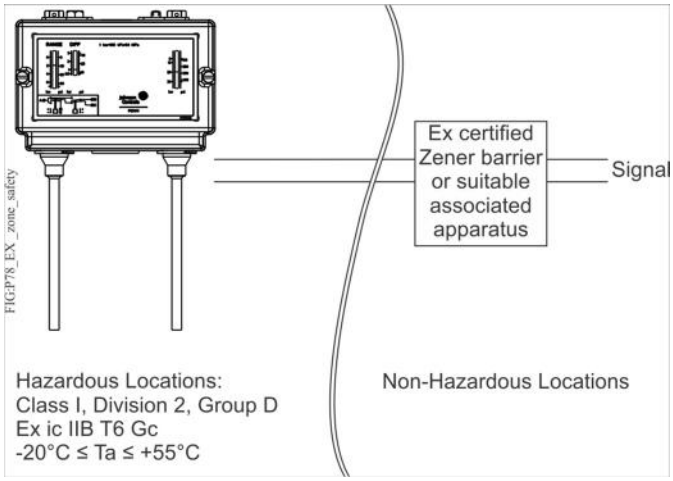


Table 3: Entity parameters (P78 Pressure Control parameters)

Parameter	Maximum switch loads
Pi max (P max)	1 W
Ui Max (V max)	30 V
Ii Max (I max)	0.1 A
Ci max	0.5 nF
Li max	0.2 µH

The selected associated apparatus providing output entity parameters must be third-party listed for the application, and have intrinsically safe entity parameters that conform with the guidelines set out in the following table.

Table 4: Intrinsically safe entity parameters for the associated apparatus

P78 Pressure Control		Zener Barrier or suitable associated apparatus
Ui Max (V max)	≥	Voc or Vt (or Uo)
Ii Max (I max)	≥	Isc or It (or Io)
Pi max (P max)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

Calculate the capacitance and inductance of the field wiring from intrinsically safe equipment to the associated apparatus and include them in the system calculations as shown in the previous table. Cable capacitance, **Ccable**, plus intrinsically safe equipment capacitance, **Ci**, must be less than the marked capacitance, **Ca (or Co)**, shown in any associated apparatus used. The same applies for inductance (**Lcable**, **Li** and **La or Lo**, respectively). If you do not know the cable capacitance and inductance per meter (foot), use the following values:

Ccable = 60 pF per 30 cm (1 ft), **Lcable = 0.2 µH per 30 cm (1 ft)**

If you do not know the Po of the associated apparatus, calculate it using the following formula:

Po = (Voc x Isc)/4 = (Uo x Io)/4

Install the associated apparatus in accordance with its manufacturer's control drawing and the ATEX Directive for installation in Europe, UKEx regulations in the UK, Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installation in Canada, and all other applicable codes.

You can use the associated apparatus in a Group II, Zone 2 or Class I, Division 2 location if the apparatus is approved for the area.

Refrigerant connections

IMPORTANT: If the control is installed on equipment that contains hazardous or regulated materials such as certain refrigerants or lubricants, you must comply with all standards and regulations governing the containment and handling of those materials.

P78 dual pressure controls are connected to the controlled equipment by a 6 mm diameter copper tube solder connection to ensure a hermetic installation.

Avoid severe pressure pulsations at high-side pressure connections. Install pressure connection to pressure-tap points away from the compressor to minimize the effects of pressure pulsations from reciprocating compressors.

IMPORTANT: After installing the control, evacuate the refrigerant pressure connection lines to remove air, moisture, and other contaminants in a manner consistent with applicable environmental regulations and standards.

Setup and adjustments

IMPORTANT: Use the pressure control settings recommended by the manufacturer of the controlled equipment. Do not exceed the pressure ratings of the controlled equipment or any of its components when checking pressure control operation or operating the controlled equipment.

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

IMPORTANT: Do not adjust pointers beyond the highest or lowest indicator marks on the control's pressure scale. Adjusting pointers beyond indicator marks may damage screw threads, may cause inaccurate control operation, and will void the warranty.

Adjusting the P78 Dual Pressure Controls

Use the following procedures for adjusting these controls. Refer to the product label inside the control cover for model number and switch action.

Dual pressure with automatic reset: Models with automatic reset have a scaleplate that displays the cut-in and differential setpoints for the low side (Callout 1, Figure 6). The high side scaleplate of the P78 dual pressure control displays only the cut-out setpoint (6).

1. Set the low side cut-in setpoint (high event; A closes to C) by adjusting the range screw.
2. Turn the low side range screw (Callout 3) clockwise to raise the cut-in setpoint.
3. Set the cut-out setpoint (low event; A opens to C) by adjusting the differential screw (Callout 2).
4. Turn the differential screw clockwise to raise the cut-out setpoint.

Note: For the low side: cut-out equals cut-in minus differential.

5. Set the high side cut-out setpoint (high event, A opens to B) by adjusting the range screw.
6. Turn the high side range screw (Callout 5) clockwise to raise the cut-out setpoint.
7. Mount the adjustment lock plates.

Note: The pressure must drop 3 bar below the high-pressure cutout setpoint to reset the switch.

Figure 6: Adjusting the P78 Dual Pressure Controls

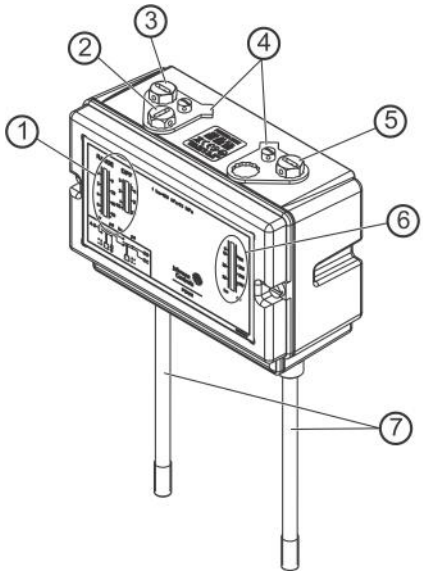


FIG:P78XLCW_Adjust

Table 5: Adjusting P78 Dual Pressure Controls

Callout	Description
1	Low Side Range and Differential Scales
2	Low Side Differential Screw
3	Low Side Range Screw
4	Adjustment Lock Plates
5	High Side Range Screw
6	High Side Range Scale
7	Pressure Connections

Technical specifications

P78 Series applications

Information	Description
Pressure connection	6 mm diameter copper tube
Ambient operating conditions	Temperature: -20ºC ≤ Ta ≤ + 55ºC (-4ºF ≤ Ta ≤ 131ºF) Humidity: 0 to 95% R.H. non-condensing
Enclosure	Cast aluminum; IP54 (Type 1 NEMA)
Dimensions (H x W x D)	Enclosure: 80 x 122 x 54 mm (3.15 x 4.80 x 2.13 in.)
Approximate shipping weight	Individual pack: 0.8 kg (1.8 lbs)

Conformity declaration information

Information	Description
Purpose of control	Pressure operating control: automatic reset controls
Construction of control	Electromechanical
Number of cycles	30,000 cycles
Method of mounting control	Independently-mounted control
Type 1 or Type 2 action	Automatic: Type 1; Type 1.C (micro-interruption)
Pollution degree	Category 1
Heat and fire resistance category	N/A
Rated impulse voltage	330 V
Over-voltage	Category 1
Ball pressure temperature	125°C (257°F)
Field wiring rating	0.5 mm^2 to 1.5 mm^2 (20 AWG to 14 AWG)
Maximum working pressure	LP: 7 barg (102 psig) HP: 30 barg (435 psig)
Cover screw torque requirements instruction	Tighten enclosure screws to: 1.3 N·m to 1.6 N·m (12 in·lb to 14 in·lb)
Compliance c UL us LISTED	**United States:** UL Listed; UL 60730-1, File SA516. NFPA 70. Class I, Division 2.
	Canada: cUL Listed; cUL E60730-1, File SA516. CSA C22.2. Class I, Division 2.
CE Ex II 3 G Ex ic IIB T6 Gc	**Europe:** CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the: Low Voltage Directive, PED Directive: Category IV Safety Accessory, ATEX: DEMKO 16 ATEX 1734 Standards: EN 60079-0 EN 60079-11
UK CA	**United Kingdom:** UKCA Mark - Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the: Electrical Equipment (Safety) Regulations 2016 Pressure Equipment (Safety) Regulations 2016: Category IV Safety Accessory UKEx Regulations 2016: UL22UKEX2373 Standards: EN 60079-0 EN 60079-11

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications Johnson Controls shall not be liable for damages resulting from misapplication or misuse of its products.

Single point of contact

APAC:

JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT
NO. 32 CHANGJIANG RD NEW DISTRICT
WUXI JIANGSU PROVINCE 214028
CHINA

Europe:

JOHNSON CONTROLS
VOLTAWEG 20
6101 XK ECHT
THE NETHERLANDS

NA/SA:

JOHNSON CONTROLS
5757 N GREEN BAY AVE.
GLENDALE, WI 53209
USA

UK:

JOHNSON CONTROLS
TYCO PARK
GRIMSHAW LANE
MANCHESTER M40 2WL
UNITED KINGDOM

www.penncontrols.com